Farmers and Water Quality

Local Answers to Local Issues

DRAFT

Evaluation of Producer Involvement

in the United States Department of Agriculture

1990 Water Quality Demonstration Projects

Submitted to U.S. Department of Agriculture

November 1992

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EVALUATION OF PRODUCER INVOLVEMENT
IN THE UNITED STATES DEPARTMENT OF AGRICULTURE
1990 WATER QUALITY DEMONSTRATION PROJECTS
DRAFT

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Preface

This report is the first in a series documenting the University of Wisconsin-Madison's ongoing evaluation of the 1990 USDA water quality demonstration projects.

The first section outlines project objectives and goals, and is followed by a review of the previous research literature pertaining to demonstration projects, adoption and diffusion processes, and attendant communication processes.

The context of the eight 1990 USDA demonstration projects is presented in the third section, including findings from an ongoing study of information and education programs being implemented in each.

Section four presents in detail the research methodologies chosen to evaluate the projects, including the development of a quasi-experimental design, and survey sampling and questionnaire construction. How the mail survey was implemented is then delineated, including discussion of validity factors and response rates.

Finally, preliminary descriptive results for key communication and adoption variables are presented to guide subsequent analyses and provide tentative feedback for project planners. More comprehensive analyses and recommendations will follow in the second volume of this series.

We gratefully acknowledge the assistance of the numerous leaders and coordinators involved with the eight state projects who shared their time and expertise. We also thank the survey respondents for their time and insights.

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SECTION 1. OVERVIEW AND BACKGROUND TO THE PRODUCER ADOPTION STUDY

In response to the President's Water Quality Initiative, the United States Department of Agriculture (USDA) developed a number of special programs to help protect or improve the Nation's water quality (i.e., the USDA Water Quality Program Plan to Support the President's Water Quality Initiative). The Soil Conservation Service, Extension Service and Agricultural Stabilization and Conservation Service support the USDA Water Quality Plan through education, technical and financial assistance. These forms of support are implemented through Water Quality Demonstration Projects, Nonpoint Source Hydrologic Unit Areas, Regional Project Initiatives, and Agricultural Water Quality Program Water Quality Special Projects as the principal activities of the USDA Plan.

Of relevance to this report are the USDA Water Quality Demonstration Projects which intend to accelerate the voluntary adoption of agricultural practices that are agronomically sound, economically profitable, while still protecting or enhancing water quality. The 1990 Farm Bill (Sec. 1238A) referred to these as agricultural water quality protection practice. This term was defined in the legislation as meaning "a farm-level practice or a system of practices designed to protect water quality by mitigating or reducing the release of agricultural pollutants , including nutrients, pesticides, animal waste, sediment, salts, biological contaminants, and other materials, into the environment." Practices that meet these criteria have traditionally been called Best Management Practices (BMPs).

A. THE BEST MANAGEMENT PRACTICE (BMP)

A BMP has been viewed as an evolving array of practices for managing animals, crops, water, or land; controlling erosion or drainage; utilizing nutrients; and controlling pests. In order to be acceptable these practices must balance agronomic and environmental effectiveness, economic feasibility, and social acceptability (Bailey and Waddell, 1979). There are several key dimensions in this definition of a BMP. First it implies that a BMP is not fixed in either time or space. Instead, a BMP must constantly evolve or be adapted to meet changing technologies, economies, and farm systems. Second, a true BMP must be more than just agronomically and environmentally sound. It must also be socially and economically acceptable to both the organizations promoting the technology as well as to the individuals who are expected to adopt this practice.

A BMP for agrichemicals and water quality can be designed around one or more of four basic dimensions. First, the BMP can demonstrate how to reduce the use of agrichemicals. Second, it

can improve agrichemical application efficiency. Third, it can be built around more "environmentally acceptable" chemicals. Fourth and finally, a BMP can be based on nonchemical alternatives. Within each of these dimensions, as well as combinations across dimensions, are a multitude of alternatives that can meet the agronomic and environmental criteria. However, even with this flexibility the underlying challenge remains the same. Before this best management practice can truly be a Best Management Practice, it must be socially and economically acceptable to the target audience.

An important objective of USDA water quality undertaking will be to demonstrate that current technologies can be acceptable along social and economic dimensions. That is, experts affirm that there are practices that meet the criteria of being agronomically and environmentally sound. USDA has initiated a number of activities that will test the degree and extent of the social and economic acceptability of these practices.

B. EVALUATION OF THE WATER QUALITY DEMONSTRATION PROJECTS

Evaluation is a critical component of the USDA activities in agricultural water quality issues. The USDA has made a commitment from the beginning to provide an objective assessment of the effectiveness of this overall effort. There is an overall strategy to evaluate water quality education and technical assistance activities involving most USDA agencies as well as the Environmental Protection Agency and the United States Geologic Survey. The evaluation will be conducted relative to all components of the USDA Water Quality Plan.

One component of this overall evaluation effort focuses on the demonstration projects. In addition to the evaluation efforts being conducted by USDA, two contracts have been given for additional analysis. The first was an innovative organizational assessment of the 1990 Water Quality Demonstration Projects by the University of Nebraska (Rockwell, Hay and Buck, 1991). This effort identified both strengths and weaknesses associated with how these demonstration projects were organized and implemented. It also provided project managers information on how their projects could be strengthened.

A second contract for specialized evaluation of the demonstration projects is the focus of this report, often referred to as the Producer Adoption Study. USDA recognized that the ultimate effectiveness of the demonstration projects would be determined by the extent that producers in demonstration areas actually change their behavior. Consequently, evaluation needs to be based on the extent that the demonstration projects induce

change among producers operating within the influence of project boundaries.

1. Purpose of the Producer Adoption Study

Eight USDA Water Quality Demonstration Projects were selected in Fiscal Year 1990. The primary objectives of these projects were to; 1) accelerate voluntary producer adoption of BMPs that will protect surface and ground waters from agricultural activities, and 2) to show how quickly and effectively producers can modify their current agricultural practices to adopt BMPs.

The purpose of the evaluation is to conduct an investigation of the eight 1990 water quality demonstration projects in terms of their effectiveness of accelerating producer adoption of selected agricultural practices that protect or improve water quality. The study will measure the rates at which targeted audiences move through the process of adopting these selected BMPs. The rate of adoption will indicate the social and economic acceptability of these practices as well as the communication effectiveness of the demonstration projects.

The basic objectives of the producer adoption study are to measure adoption across time by specified target audiences, account for practice demonstrations and other communication influences on this decision process, and then interpret the findings in such a way that it will enhance future technology transfer efforts.

This five-year study evaluates the extent the USDA Water Quality Demonstration Projects accelerate the voluntary adoption of best management practices. This study will measure changes in the adoption of these practices across time, account for demonstration and communication influences on this decision process, and interpret the findings in a way that will enhance future USDA water quality efforts.

The focus of the study, the 1990 Water Quality Demonstration Projects (California, Florida, Maryland, Minnesota, Nebraska, North Carolina, Texas and Wisconsin) all have documented water quality problems related to agriculture. Moreover, each demonstration area is unique in the mix of production techniques, producers, and the nature of the water quality risks.

The goal of each demonstration project is to encourage farmers to adopt best management practices compatible with local production situations yet capable of addressing sources of water quality degradation. Each project is designing communication campaigns built around on-farm demonstrations to convey appropriate information to surrounding farmers. The projects

will also rely on financial and technical assistance to accelerate the voluntary adoption process.

The producer adoption study is built around a quasi-experimental research design. Comparison areas were identified by local project staff after matching on physical and farm enterprise features. It was decided that comparison areas needed to be part of the research design in order to accurately measure the influence of the demonstration project on accelerating the voluntary adoption of best management practices. Large representative samples of producers in each demonstration and comparison area are being surveyed at four points in time. Participating landusers have been selected using spatial sampling techniques to avoid any biases associated with existing lists. Approximately 50% of the sampled producers were surveyed in 1992, another 30% plus the original 50% will be surveyed around selected issues in 1993 and 1994, and the remaining 20% plus the combination 80% in 1995.

The evaluation will be guided by a combination of technology adoption and agricultural communication models to address: (1) initial farmer awareness, knowledge, receptivity and behavior relative to the best management practices being demonstrated; (2) responses to the demonstration and other communication efforts as well as an assessment of the proposed remedial practices; and (3) the impact of these demonstration efforts on changes in knowledge and extent of adoption of the demonstrated practices.

Consequently, the proposed evaluation will focus on two major issues: first, to measure the effectiveness of a demonstration as a dissemination mechanism for communicating the necessary attributes of selected BMPs; and second, to measure the rates at which the target audiences move through the adoption process as an indicator of BMP social and economic acceptability and communication effectiveness.

2. Factors Measured

Several specific factors will be measured at one or more points in time in order to accomplish the above objectives. These can be organized into individual, assistance networks, farm characteristics, demonstration features and other factors.

Individual Characteristics

Of primary interest are the individual farmers and ranchers who are expected to adopt the recommended BMPs. Measures were obtained of changes in following variables:

1. The **level of awareness** of specific, relevant BMPs. Respondents were presented comprehensive definitions or

descriptions of BMPs and asked if they were aware that this practice was available for their local area.

2. Changes in the **level of knowledge** about these BMPs. Accurate and complete knowledge is necessary for a valid evaluation of the BMP. Respondents were asked to assess the accuracy of a series of statements about selected BMPs. Results will indicate the level of knowledge on these BMPs.

3. How this knowledge, after controlling on completeness and accuracy, is employed in the **evaluation of specific BMPs** was also be assessed. That is, respondents were asked to evaluate each BMP along agronomic, economic, and social dimensions. Also measured were pre-existing perceptions and cognition about the capability of these BMPs to significantly affect water quality.

4. Other more **standard individual measures** were also obtained, such as age, formal education, years farming experience, influence of landlords and future plans, etc.

Assistance Network Linkages

The evaluation also took into account producers' linkages and orientations toward communication sources.

1. Farmers' and ranchers' use of various **sources of information, education and assistance** regarding water quality-related practices. Specific measures were made of: (A) producers' frequency of use of such sources; (B) the perceived agronomic and economic utility of the sources; (C) their credibility; and (D) their perceived influence on actual practices.

2. A similar assessment was made of the **communication activities** associated with the demonstration project. Investigation of these communication-related factors was needed to determine: (A) how pre-existing orientations to communication programs are related to exposure and impact of the demonstration programs; (B) whether such pre-existing orientations may in and of themselves contribute to changes in adoption over the study period; and (C) how they may interact with demonstration activities to affect adoption rates.

Farm Characteristics

A number of farm or ranch characteristics have also been measured. Additional information on the farm or ranch operation will be obtained in later phases of the evaluation project.

1. Farm **economic features** such as dependence on specific commodities or farm enterprise mix, past fluctuations in the prices of those commodities, changes in the price of applicable farm inputs, farm and nonfarm income, and cash flow status.

2. The **proximity (distance, travel time) to the demonstration project sites** were measured in the demonstration areas.

3. **Scale of operations** (size) and certain labor characteristics were also measured.

4. The **tenure** of the land operated within the farm organization was also measured under various tenure arrangements.

5. The specific **application levels of agrichemicals** associated with the selected BMPs. This focused, where applicable, on nitrogen, herbicides and insecticides.

6. The primary dependent variable in the project will be a measurement of the **change in the extent of adoption of specified BMPs** across the project. Consequently, for those farms where recommended practices are used, a measure of the extent of use was obtained.

Demonstration Characteristics

Information was collected on the nature and type of the demonstration project. In the comparison sites this measurement focused on other communication and assistance efforts. Much of this data was collected from secondary sources, i.e., not from the farmers or ranchers but from project personnel and other local information sources.

1. In the demonstration areas this focused on the **type, extent, and intensity of communication efforts** surrounding the water quality project.

2. Respondents were also asked to **evaluate various information transfer techniques** (e.g., field days, demonstrations, fact sheets, video, small group meetings, on-farm visits, etc.) in order to develop

accepted strategies or techniques to improve technology transfer by USDA and cooperating agencies.

3. Each demonstration effort was **classified according to a public communication campaign framework.** This latter effort has depended on secondary materials, plans of work, and observations by farmers or ranchers. This included classifying each demonstration site according to: (A) specification of discrete objectives, (B) segmentation of the target audience, (C) sequence of planned activities within a specified period of time, and (D) adaptation of communication activities as diffusion occurs within the demonstration area.

4. The baseline data necessary to quantify the **change in the extent of adoption of specified BMPs across the project area** was also obtained. This measure will be compared to the comparison area to quantify the extent of accelerated adoption in the demonstration area.

5. The **characteristics of any water quality efforts or programs found in demonstration and comparison areas.** This included documentation of the program or effort, assessments by local staff charged with implementing this program, and questions relating to an assessment of this program or effort in the respondent questionnaires.

Other Factors

Other variables measured in the baseline included a range of economic, cultural, social and environmental factors that could discourage producer involvement in the projects. A copy of a representative questionnaire is attached in an appendix, and provides a listing of other factors.

C. IMPLEMENTATION OF THE PRODUCER ADOPTION STUDY

This is a complex project to implement for a number of reasons. First, the original project proposal was revised a number of times in response to various issues and concerns raised by various agencies, groups and other interests. Second, the number of people involved has grown exponentially as the Wisconsin team sequentially developed working relations with national USDA staff, state USDA staff, local project managers and staff, and finally the landusers. Developing cooperative working relations with all these different levels has proven to be a very time-intensive task. Third, the 1990 demonstration projects represent a very diverse sample of farm enterprises, production

techniques, physical settings, water quality problems, traditional local agency-landuser relations, and management styles of the demonstration projects. The challenge was to develop a common analytical framework for eight very diverse projects. Finally, there was no previous research of this magnitude or scope that could be used as a model. New procedures had to be developed for every stage of the process. A brief summary of the temporal development of the project as well as some of the major changes follows.

1. The Development of the Producer Adoption Study

An interdisciplinary research team responded to the USDA request for proposals by submitting a proposal on April 30, 1990. The Wisconsin team were notified on May 18 that they were one of two finalists for the contract. They were asked to submit a revised proposal to address common concerns found in both of the finalist's proposals. A revised proposal was submitted on June 8, and a presentation was given to USDA national staff on June 19, 1990. On June 22 the Wisconsin team were notified that their proposal had been accepted contingent on further modifications in the proposal. A cooperative agreement was signed between USDA Extension Service and the Director of the Wisconsin Cooperative Extension Service on August 27, 1990. An operating account for the evaluation effort was received on September 17, 1990.

Spatial Sampling

The first major change to the study involved the sampling frame. The accepted proposal called for local project personnel to furnish all the names and address of agricultural landusers within demonstration and comparison areas. However, the National Agricultural Statistical Services (NASS) raised legitimate concerns about potential biases found in local office lists. After extensive discussions and a meeting in Washington DC it was decided to shift to a spatial sampling process.

This transition required significantly more time and resources than originally planned. Following discussions with NASS, the original intent was to use the techniques developed by the National Resources Inventory (NRI) as a model for the sampling frame. However, further analysis found some significant differences between the NRI and the objectives of the Producer Adoption Project. The most notable being that the NRI is designed to represent of <u>land use</u> whereas the Producer Adoption Project had to represent <u>land users</u>. Consequently, a new spatial sampling procedure had to be developed. This process is described in more detail in a later section of the report.

The critical point relative to the scheduling of the project is that hundreds of aerial photos had to be obtained from ASCS

offices in Salt Lake City, Utah. This was again a time consuming process even though there was a high level of cooperation by ASCS personnel. All the necessary maps were obtained by April of 1991 which only meant the actual sampling process could begin. This involved drawing a number of proportionate grids (decision rules on this process are discussed later) on maps where demonstration and comparison boundaries had been located. Within each grid a number of points were located. At that time project personnel had to travel to each local ASCS office where the sampled points were located on ASCS data sources to obtain data (name and address among other information) on the operator of selected points. Again, local personnel in ASCS offices were extremely cooperative and helpful. Yet this revised sampling process was not completed until late July of 1991. This sampling shift prevented any possibility of meeting the original schedule for collecting the baseline data during early 1991.

Selecting the Best Management Practices

Another lengthy process not anticipated in original cooperative agreement negotiations was the identification of the BMPs that would be measured in each project. There is a separate section in this report on BMP selection processes. The following discussion only outline the temporal process by which this occurred.

Measuring the extent the demonstration projects accelerated the adoption of various practices not only required a sophisticated experimental design, it also required fairly sophisticated measurement of the adoption decision itself. Simply asking respondents if they were or were not using a practice was judged to be insufficient. Instead, the proposal called for measuring a number of agronomic, management and farm behaviors from which accuracy in and extent of adoption could be deduced. This involved asking a number of detailed questions for each BMP. Since over 100 potential BMPs had been identified in the eight demonstration projects, for more than expected when the proposal was submitted, it quickly became apparent that this list would have to be reduced to a manageable number, i.e., a number that would not add excessive length to the questionnaire.

The revised proposal called for each project to identify two "high priority" BMPs, and then to select three additional BMPs common to all eight projects, i.e., "national BMPs". It was found that there was not even one BMP that was common to all eight projects.

The Wisconsin team then developed a BMP classification process where project leaders and staff in all eight sites, as well as individuals with the necessary technical competence in the national offices, were asked to classify the long list of

BMPs along four dimensions (capital requirements, labor requirements, managerial requirements, and divisibility). Statistical techniques were then used to identify common groups or clusters of BMPs. A cluster represented a group of BMPs that have similar values on the four dimensions. Again, this process just described took significantly more time than planned. This process was completed by May of 1991, which allowed our study team to start obtaining technical information on the selected BMPs so that appropriate questions could be developed.

Questionnaire Development

Developing a questionnaire also proved to be a long and challenging process. This was the case for two reasons. First is the diversity issue mentioned above. Technically accurate questions had to be developed that captured a eclectic set of BMPs operating under far more different farming or ranching systems than originally anticipated. Diversity was also an issue because of the experimental design. Questions had to be altered or substituted depending on whether it was a demonstration or comparison area. A total of 21 different questionnaires were created. For example, Florida had four different versions; a citrus and vegetable version for the demonstration area, and a citrus and vegetable version for the comparison area. Superimposed on all this diversity was the need to develop a common conceptual framework that would allow the evaluation of a **national** program.

A second reason why questionnaire development was such a long and challenging process was the study team commitment that this would not be an external effort superimposed on local projects. Demonstration project personnel at all levels could comment on the entire questionnaire development process.

This last reason, however, also raised additional restrictions to a quick development of the questionnaire. Project personnel at all levels received early versions of the questionnaire when it was in a "crude" or "rough-draft" format. Sending this out for comments on the technical dimensions of BMP adoption immediately raised concerns over length (it "has 263 questions with 1,094 choices that the growers must select from resulting in a survey which is TOO LONG, I must say"), and that some questions will be considered "offensive" to local landowners. Revised versions of the questionnaire still did not satisfy all the project personnel. Site visits by the Wisconsin team had to be quickly scheduled to try and maintain a cooperative relationship. The extent of resistance to cooperative questionnaire development by some local project personnel was not anticipated.

This process of trying to balance the need to measure certain items as specified in the cooperative agreement, remain technically accurate, and still address local concerns over the length of the questionnaire and the nature of certain questions was not resolved until late October of 1991. The next step was to pre-test the modified questionnaires with "known users and non-users" of the BMPs as identified by local project staff. This was completed in November of 1991.

Final revisions were made to the questionnaire based on the pre-tests. In December of 1991 the Wisconsin team was ready to begin producing final versions of the 21 questionnaires using desk-top publishing procedures.

2. Cooperative Working Relations with Demonstration Projects

The final outcome of this project will depend on knowing more than whether farmers and ranchers did or did not adopt recommended BMPs. It will also depend on knowing what local demonstration project personnel did or did not do to help induce any changes that might occur. Consequently, gaining an understanding of the projects from the perspective of local project managers has been a high priority from the beginning.

All projects were visited at least twice by members of the Wisconsin team. In addition, there has been a continuous flow sequence of telephone, mail and reports between Wisconsin and demonstration project personnel. An example of this follows.

> "As has been the case since the beginning of our involvement in this project, we are always willing to listen to any comments, concerns or questions you may have about our project. We hope to prepare another report of our activities within the next month. This will review our past activities as well as report on our future plans. These reports are a high priority because we feel your continued cooperation is dependent on understanding what we are doing and why it is being done. It is our hope that we will be able to repay your significant investment in our project by providing useful information following the 1992 and 1993 data collection efforts" (letter to project managers 7/30/91).

The philosophy of the Wisconsin team from the beginning has been to develop a feasible cooperative working relation with each demonstration project. A 3-way memorandum of understanding was signed early in the project by the involved USDA agency administrators (ES, SCS, ASCS) <u>directing</u> state and local agency personnel to cooperate with the Wisconsin efforts. Wisconsin has avoided using or even referring to this memorandum due to the

above philosophy. Although building a cooperative working relation -- as opposed to an authoritative one -- may be more costly (time and resources) across the life of the evaluation, it should be more productive.

SECTION 2. THEORY AND RESEARCH BACKGROUND

This evaluation of the USDA 1990 Water Quality Demonstration Projects occurs in the context of theory and past research. These need to be reviewed to provide the justification for the methods and techniques used in the evaluation process. The review inter-relates three major sections; on-farm demonstration, adoption of farm practices and communication processes.

A. ON-FARM DEMONSTRATIONS

1. The Nature and Rationale of On-Farm Demonstration

On-farm demonstration has a long history in the United States predating the formation of both the United States Department of Agriculture and Land Grant University system in 1862. Recently there has been a resurgence of interest in on-farm demonstrations. This renewed interest is often associated with sustainable agriculture, water quality best management practices and other efforts to reduce negative social and environmental impacts of agricultural activities.

Interest in on-farm demonstrations is also tied to an increased awareness by agricultural researchers of the constraints farmers face when evaluating new technologies or practices. Farmers are not free to choose any or all of the many new technologies or practices that emerge each year. Moreover, formal communication efforts often lack the type of information needed by farmers to accurately evaluate these practices (Krome, 1989; U.S. Congress, 1988). Researchers and program administrators are recognizing that on-farm demonstrations are one way of addressing certain constraints to adoption. That is, there is increasing recognition that a well-designed on-farm demonstration can accelerate the voluntary adoption of recommended practices.

A Working Definition of On-Farm Demonstrations

One of the problems with understanding on-farm demonstrations is the confusion over exactly what constitutes such an activity. The situation is confounded when the terms on-farm demonstration and on-farm research are used synonymously. Many activities are called "on-farm research" when no formal agricultural research is being conducted. Conversely, "on-farm demonstration" has been used to describe formal agricultural research activities conducted on a farm. It is clear that there has been confusion in the use of these two terms. Although there

is, these terms are often interchanged, they have different meanings and functions.

The first and most obvious distinction is between the overall objectives of on-farm demonstration and research. At a fundamental level, on-farm demonstration uses the outcome of experiential learning ("learn by doing") to extend these results by means of observational learning ("learn by seeing") through community or agricultural networks. This implies that the cooperating farmer "learns by doing," and then passes on the information gained by giving neighbors and others in social and kin networks the opportunity to learn by observing (Wake et al., 1988). The farmer managing the demonstration effort may have either developed the technique, be cooperating with change agency personnel, or observed the technique elsewhere and adapted it to local conditions.

On the other hand, on-farm research implies use of basic or applied analytical techniques where both randomization and control of treatment effects are used. The primary objective of research, on-farm or elsewhere, is to discover unknown facts or to explain variation in the phenomena under investigation. The results of this effort are either passed on through professional or research networks to guide future research, or used as a basis for the development of extension and outreach materials. This is very different from on-farm demonstration where the primary objective is to disseminate known research results in an effort to change farmer behavior.

Differences in On-Farm Functions

This distinction by focusing on the overall objective, however, is not completely adequate. It is too broad to recognize all the functions that researchers or farmers use in conducting research or demonstration. It is possible, and in fact common for researchers to use farms as sites for agricultural production experiments. Nor is it unusual for research sites to be used to demonstrate farm practices. More attention, therefore, needs to be given to examining <u>why</u> the activity is being conducted. That is, focusing only on activities that are being conducted, or the location of those activities is not always sufficient to distinguish between on-farm demonstration and on-farm research. In both the design and evaluation of on-farm demonstration, attention needs to be given to the intended functions of the activity. Figure 1.1 outlines the distinctions between on-farm demonstration and on-farm research.

FIGURE 1.1: FUNCTIONS OF ON-FARM RESEARCH AND DEMONSTRATION[1]

ON-FARM RESEARCH	ON-FARM DEMONSTRATION
To obtain research data on particular soil types or other physical conditions that are not available on a experiment farm or any other available research sites.	Primarily as "validation sites" since they act to screen a practice, method, or system by "getting the bugs out" before wide-scale promotion to the farming community. Validation occurs by showing farmers how the practice might work on their own farms under similar soils, climate and other relevant factors.
To study phenomena that must be on a larger tract or plot than is available on an experiment station or available research site.	Similar to validation is the idea of adaptation. An on-farm demonstration can serve to illustrate how specific system components were changed or adapted to increase efficiency or compatibility.
To analyze system effects that involve interactions among several enterprises or farming methods. This type setting can serve as the basis for the focus of component, commodity, and discipline research and the selection of priorities.	To reduce risk and learning costs associated with a new practice or method. It does this by deriving acceptable, site-specific management strategies from general or blanket recommendations.
To analyze a farm's performance under realistic farm conditions to hypothesized performance under experimental conditions.	To increase the credibility of researchers viewed as out of touch with the day-to-day realities of farming. This credibility enhancement occurs when farmers and researchers meet at demonstration sites to discuss problems and potential solutions. On-farm research with farmer involvement can have this benefit as well.
To study the long term effects of a production method already being used on a farm, or to analyze a unique production method practiced by some farmers but has not received attention from researchers.	
To create cooperative links between extension and research efforts which can improve both.	

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[1] Adapted from Hilldebrand and Poey, 1985; Lockeretz, 1990

Both on-farm research and demonstration can be a learning process for farmers, researchers and extension personnel by defining and refining the appropriate domains where particular technologies are appropriate. Finally, there is an intermediate type of on-farm activity that combines some of the traits of both on-farm demonstration and research. Farmers engaged in on-farm demonstrations often conduct "experiments" that are not true research experiments. Yet, they are clearly more than simple demonstrations. This is where, for example, a field receives two treatments of fertilizer or seed variety. This type of experiment often does not employ randomization, control of treatments nor replication required of valid research. On the other hand the farmer will gain useful insights through conducting the experiment. The most important in this regard is the heightened awareness of interactions and attention to detail necessary even in the most elementary trials. This increased attentiveness will provide valuable learning opportunities that would not present themselves were it not for the conducting of "experiments". Conversely, if the "experiment" fails in the farmers mind, due not to actual differences but to failure of the research design, the farmer may base conclusions on inaccurate information.

Conducting scientifically valid research on an actual working farms is problematic. Trying to come up with research designs that are both amenable to farm scale equipment and talent of farmers while still meeting rigorous scientific requirements is not easy. The Practical Farmers of Iowa, Leopold Center and the Rodale Institute have developed a method that effectively bridges the gap for many kinds of field experiments. They recommend the paired-comparison, employing randomization, replication and control treatments, for farmer-managed trials. This method appears to satisfy the needs of farmers and researchers alike.

In summary, on-farm research has the primary objective of knowledge generation under a number of specific conditions while employing standardized methods. On-farm demonstration has the primary objective of knowledge dissemination.

2. Dimensions of On-Farm Demonstrations

The function of this section is to briefly explain the concept of on-farm demonstration to assist in the evaluation of the USDA Water Quality Demonstration projects. One method of enhancing explanation is to examine underlying dimensions of a concept. Classifying on-farm demonstration by component dimensions should assist in understanding this concept and method. There are at least three relevant dimensions of on-farm demonstrations. These are outlined below.

Farmer Involvement in On-farm Demonstration

A critical dimension in on-farm demonstrations is the amount of input and control the hosting farmer has over the demonstration. Ashby (1986) has identified three broad levels of farmer input and control.

i) The first is where there is nominal participation by farmers, and where researchers or change agency personnel manage and implement the demonstration. Its purpose is to gain acceptance of practices or methods by farmers. This type of demonstration does not generate any information about how farmers respond to the practice or method. That is, it does not have the objective of gathering information on compatibility of recommended practices to farms in the demonstration area. Researchers or agency personnel define the problem, identify the solution (recommended practice), and try to persuade farmers they have this problem requiring the demonstrated solution.

ii) The second level is where farmers play a consultative role with researchers or agency personnel in problem and solution definition. Here the emphasis is on farmer circumstances, recognizing that farmers have subjective goals and preferences as well as objective situations about which they need to be consulted. However, it is important to note that the practice or method has already been screened by researchers or agency personnel. These external parties determine what is to be demonstrated, why the demonstration is necessary, and design the demonstration. The consultive role of farmers is limited to identifying problems with implementation due to a farmers subjective goals or objective situations.

iii) The third level is where the farmer participates in a decision-making role. This type of on-farm demonstration is characterized by farmer involvement in all aspects of the demonstration. Farmers not only specify the problem, but also are responsible for developing the remedial practice or method. Farmer involvement is before researchers or agency personnel establish the design of the demonstration thus screening out options they deem inappropriate. This type of on-farm demonstration also allows farmers to make judgments independent of researches or agency personnel about implementation or evaluation.

It is suggested that there are at least four features that should define the level of farmer involvement required. The first concerns the scope of the production process to be

demonstrated. There are many levels of analysis that could be considered at on-farm demonstrations. At the simplest level are single farming practices. A practice is a separate task or operation, such as plowing or cultivating. A method consists of combinations of practices directed at a specific objective, such as weed control or crop production. For example, a tillage method, such as conservation tillage, is made up of several practices one of which may be the practice of chisel plowing. At the next level is a farming system which takes into consideration the "overall approach used in crop or livestock production, often derived from a farmer's values, goals and knowledge, available technology, and economic opportunity (National Academy of Sciences, 1989). There is some confusion in the research literature as to what constitutes a farm system as it depends on what is considered part of the "system". Including the various enterprises making up the production system is fairly common. Less common is the inclusion of the farm family and interactions of labor, tenure, management, land and the social and cultural context of the production system.

As would be expected, moving from a practice to a method and finally to a system requires greater planning, coordination and farmer participation for an effective on-farm demonstration. It also increases the probability that results or implications from different times of the production cycle will have to be demonstrated in some fashion. Demonstrations focusing more toward production systems need greater farmer involvement to insure critical impacts or interactions (e.g., labor shortages during certain parts of the production cycle) have the opportunity to be acknowledged or measured. The greater the complexity of the demonstration effort, the greater the required level of farmer involvement.

A second feature of on-farm demonstration that determines level of farmer involvement is the past participation and cooperation of the target audience. If neighboring or target farmers have had a high degree of cooperation in past programs, then less farmer involvement in the demonstration would be needed. Of course, the converse would also be true, i.e., low past cooperation implies the need for higher farmer involvement. Important to bear in mind is the wide variation between "programs". A university extension demonstration will most likely have a different clientele than a demonstration of a for-profit organization. Participation in past programs is not uniform across all programs.

A third feature of on-farm demonstration that determines level of farmer involvement is the existing level of problem recognition, i.e., need for a demonstration. A high level recognition of the problem would require less farmer involvement. If most farmers in the neighborhood already acknowledge a problem (e.g., water pollution, pest infestations, etc.), then the

demonstration can focus on possible solutions. Little effort needs to be given to involving the farmer in defining the problem.

A fourth feature of on-farm demonstration that determines level of farmer involvement is the profitability of the demonstrated practice. Demonstrating practices that become profitable only with financial assistance from the government would require less farmer involvement. Many practices in the area of natural resource management such as conservation structures become profitable, if at all, only with the assistance of cost-sharing from the government. The technical rules surrounding cost-share payments require a fairly exact specification of a problem and acceptable solution. All this limits potential involvement by a farmer in the demonstration.

Accessibility

A second dimension is the access other farmers have to the on-farm demonstration. This includes several features, but generally refers to the ease in which other farmers can gain access to the information across time and space. Temporal accessibility can vary between one-time field days to informal and unguided tours or site visits available across the whole production cycle. Spatial accessibility refers to distance to other farms, location of the demonstration relative to public roads, and location within the farm operation.

The importance of temporal accessibility varies by the sequential interdependence of the production activities, and whether the demonstration is procedure or result oriented. The more the outcome of a practice or method is dependent on previous activities (sequential interdependence), then it becomes more important that farmers either have the opportunity to observe this sequence, or information on this sequence needs to be part of the demonstration effort.

Variance in temporal and spatial accessibility depend on whether the demonstration is procedure or result oriented. Demonstrations on the results of practices need only have limited temporal accessibility, i.e., only demonstrate the end results such as yields, net profits, etc. However, demonstrations on procedures require greater temporal and spatial accessibility so that farmers have an opportunity to observe the timing of activities, their sequence, relative importance, and constraints associated with the practice. Rotational grazing systems are a good example of this. A demonstration showing only one point in time with no reference to past and future management implications would not impart sufficient information necessary for this grazing system.

Selection of On-Farm Demonstrations

An often overlooked, but critical third dimension of on-farm demonstration is the degree the host farmer and farm represents the surrounding farm community or the target audience. An implicit objective is for the demonstration farmer to become a role model in the use of the technique being demonstrated. As is the case in the non-agricultural world, selection of a role model is an important decision. Selection of the demonstration farmer can have a major impact on the success of the overall demonstration effort in meeting its objectives. Acceptability of the demonstration to the target audience is directly related to the farm and farmer hosting the demonstration. In addition to selecting a demonstration farm on the basis of agronomic criteria (soils, applicability, etc.) two additional features need to be considered.

The first is the social position of the demonstration farmer in the local farming community or the target audience of the demonstration effort. An informal community or "opinion leader" is the ideal host of a demonstration effort, which allows the "trickle down" processes behind the concept to work. These are individuals who have developed certain talents, traits, or skills and are looked to by other farmers for providing a judgement or assessment on what is acceptable or "progressive" in local farm management. Sociologists' would label such farmers the nexus points on a sociometric map of the local farming community. That is, these individuals are centrally linked into the major communication and social networks of the community. They are the "good farmer," however that may be defined, that other farmers observe and often emulate.

The second feature for selecting a demonstration farm is an assessment of how representative the demonstration farm is relative to other farms in the targeted area. Contrary to common stereotype and the tendency to classify farmers as a homogeneous group, there is tremendous diversity between farms. This can be along physical, enterprise, economic, and social dimensions. Ideally one selects a demonstration farm that is representative of the target audience of the demonstration. For example, one does not select an organic farmer to demonstrate weed control in corn to a target audience of conventional farmers. Nor would it make sense to select a large, capital intensive farm dependent on hired labor to demonstrate a technique to smaller farms with labor constraints.

B. THE ADOPTION AND DIFFUSION OF AGRICULTURAL PRACTICES

Understanding the nature and rationale of on-farm demonstrations requires an understanding of how farmers become aware of and begin using new practices. A large body of research

exists within the social sciences that studies why individuals adopt technologies. This body of work has developed into a widely recognized model known as the adoption-innovation diffusion theory (see Buttel, et. al., 1990:46-72). The pioneering work of Ryan and Gross (1943) investigating the introduction and use of hybrid seed corn in Iowa between 1928 and 1941 was one of the first studies employing this model. It is considered the classical study of the adoption-diffusion process in agriculture.

1. Adoption

Although there is a tendency to treat adoption and diffusion as discrete events, both of these concepts represent processes. That is, both adoption and diffusion represent a related series of events that occur across time relative to an innovation. An innovation is any practice or idea perceived as new or different by the target population. Adoption is the process where the adopting unit, often an individual, moves through a series of identifiable stages toward incorporating an innovation into the farm operation. Diffusion is the spatial dispersion of this innovation across the farm population, i.e., the cumulative pattern of adoption decisions. The adoption process is often categorized into a series of stages representing the decision process. The adoption model is a set of interrelated stages, from awareness and interest, through evaluation and trial, and finally to full adoption and/or adaption of a technology (Rogers, 1983). Rejection of a technology is possible anywhere in this process. An important distinction to bear in mind is that technologies are not just mechanical and chemical but can also be embedded in a cultural practice (intellectual) or economics (policy). These stages can be summarized as follows:

Awareness - Information Stage

An individual must first either become **aware** of a problem and seek a solution, or discover a solution to a previous unknown problem. In the resource management area this implies one of two sequences. First, an individual can become aware of a problem such as excessive soil erosion or water pollution, and if the consequences of this problem are deemed to be significant, seek a solution. In this sequence resource management officials attempt to teach problem recognition and evaluation based on available technical or programmatic solutions. The emphasis is on recognition and salience of the problem.

In the second sequence, resource management officials promote practices or programs that are capable of addressing hitherto unrecognized problems. As often happens in the commercial sector, the practice or program is promoted as

increasing the efficiency of the operation. In this latter sequence the farmer is expected to view the practice as the "solution" to a problem which has either been unrecognized or deemed insignificant in the past. The success of this latter sequence is also dependent on the degree of problem recognition and salience instilled among the target audience. However, in this sequence the emphasis is on the practice or program with the expectation the farmer will recognize the problem.

Awareness of a practice or problem does not just happen. Awareness results from the communication of information regarding the practice or problem. The information can be communicated through both formal and informal channels. The clarity of the message in this communication process also varies. All this indicates that a major factor explaining the first stage of this adoption process is the nature of the communication network in which the farmer is linked. Resource management programs should theoretically be designing different communication efforts around the same problem or practice in order to link into these different information networks. Reliance on one communication technique (e.g., fact sheets, demonstrations, newsletters) will only contact a subset of the overall target population.

Evaluation Stage

The individual will then **evaluate** the practice based on existing information and knowledge. The principal dimensions of this evaluation are relative advantage (cost/benefits) and compatibility to the operation. Other minor dimensions of evaluation include are complexity, divisibility, and visibility of results.

Two sets of factors guide this evaluation process. First are the **objective attributes** of the practice or problem. That is, what objective analysis defines as the relative advantage or compatibility of a practice in a specific setting. For example, structural practices to control excessive erosion often have low relative advantage (high cost and little benefit over an extended period of time), and high incompatibility (structures inhibiting equipment operations). Or in the case of the objective attributes of a problem, erosion defined as excessive based on soil tolerance values may not be defined as excessive based on productivity damages. The adoption process depends partially on the outcome of this evaluation of the objective attributes of the problem or practice. Conservation officials and technicians rely largely on these objective attributes in building their persuasive messages.

There is, however, another factor that will influence this evaluation process. In large part evaluation is a series of "what if" mental exercises based on existing information as well

as the cognitive abilities of the farmer. Incomplete or inaccurate information on the practice or problem will strongly influence the outcome of the evaluation process. Moreover, inadequacy or limitations in the ability to mentally "visualize" farm system impacts, agronomic requirements, or consequences will also influence this evaluation process. This implies that one cannot assume that the farmer evaluates the practice or problem on the basis of perfect information or assessment ability. It is on this factor, **perceived attributes** of the problem or practice, that most institutional arrangements are (should be) focused. One detects these perceived attributes in farmer testimonials or in the explanations given for non-adoption (e.g., "I can't afford it as it is too expensive," or "the problem really isn't that bad."). While technological developments attempt to change or alter the objective attributes of production techniques, resource management programs need to influence the perceived attributes through education, technical and financial assistance efforts. Both, however, have the same objective; to induce a positive evaluation of the resource management practice.

Trial and Use Stages

The last stage in the adoption process refers to some degree of use of the practice in the farm operation. At this point the farmer has become aware of the practice and/or problem; has determined the practice or problem to be salient enough to spend additional effort seeking more information; was able to obtain adequate information to evaluate the compatibility and relative advantage of the practice; and the outcome of this evaluation was positive. The process through these stages can be detained or delayed if any of the conditions specified are missing or insufficient. If all these pre-conditions are met, then depending on the divisibility of the practice, trial on a small scale basis often occurs.

Trial represents the transition from a "will it work?" question to one of "can I make it work on my operation?" The potential adopter is still evaluating the practice at this stage, but in much more specific as opposed to general terms. Compatibility and economics are all being evaluated within a specific context of soils, climate, machinery, and labor among others.

In addition to this on-going evaluation process, the farmer must also make a decision in terms of applicable areas within the farm. The resource management practice may not be needed or appropriate for all areas of the farm. Deciding if the practice should be adopted is tempered with the need to decide on the extent of adoption.

If the trial decision is positive, then the practice will be

adopted in applicable areas. However, even in the resource management area with its strict technical guidelines, it is rare for a practice to adopted without modification. The adoption decision actually concurs with on-going adaptation for increased compatibility and relative advantage. The extent that the practice can be modified or adapted to better fit specific farm conditions varies with the nature of the practice. The more flexible a practice, the greater the likelihood of a positive evaluation because of this adaptive potential. Moreover, changing markets, technology or even pest or climate cycles all predispose the farmer to seek flexible practices.

2. The Concept of Diffusion

As mentioned earlier, diffusion refers to the spatial dispersion of an innovation across time. Diffusion is often measured within a specific geographical or political setting. Examination of diffusion processes attempt to explain the factors that facilitate or hinder this process. Diffusion research often provides a description of **who** adopts **when** relative to others in this geographical area. Initial research terms such as "innovator," "early adopter," or "laggard" have moved into everyday language to represent this relative relationship. Two key concepts in the resource management area have been used to explain diffusion; informal networks and infrastructure.

Informal Networks

This concept refers to the process of farmers communicating with other farmers regarding a resource management practice. Existence of a resource management practice or problem, the perceived attributes of this situation, and evaluation of the compatibility and relative advantage have all been documented in these informal networks. The importance of these networks is that while conservation officials may have scientific credibility, certain neighbors or other farmers are viewed as trustworthy. The assessment of a resource management practice or problem by another farmer can be more important than scientific data in an evaluation decision.

The procedure of establishing demonstration farms, fields or practices in a farming community is built on this concept. The theory is to find an informal opinion leader, someone who's assessments and judgments are central to an informal network, and have this person sponsor the demonstration. This can be either a very formal process where sociometric maps of informal communications are created, or an informal selection based on the perceived community reputation of an individual.

This same concept underlies the practice of testimonials.

Farmers, rather than conservation officials or technicians, offer a public assessment of a resource management practice. Depending on the location of farm, this type of persuasive message is often viewed as being more credible than one based solely on objective attributes.

The potential utility of the informal network is linked to the idea of a two-step flow of communication. That is, change agents officials may initiate the knowledge or information, but the second step is when it flows out into this informal network. Knowing the nature and composition of these informal networks in an area offers the potential of integrating communication efforts within the networks, rather than being independent of them.

Infrastructure

This concept was developed after studying the diffusion of private sector or commercial innovations. It is recognition of the fact that the location of facilities (sales outlets) that offer products, service or assistance influence the diffusion pattern of that product. Lawrence Brown (1981) in his book on innovation diffusion discusses two general models. What he calls the traditional model focuses on the demand side of the equation. That is, those personal, situational and farm firm factors that compels an individual to adopt an innovation. Much of the traditional adoption research has emphasized these factors. This contrasts with what he calls the market-infrastructure model which focuses on the supply of innovations. The loci of this model are institutional characteristics, both private and public, that affect access to the innovation as well as establish various constraints under which individual decisions are made.

These institutional characteristics will influence the adoption of new practices in two general ways. First, "the location of the agencies and the temporal sequencing of their establishment determine where and when the innovation will be available and provide the general pattern of the spatial pattern of diffusion" (Brown, 1981:51). Second, the specific promotional or implementation strategy selected by each agency will "contribute further detail to the spatial pattern of diffusion by creating different levels of access to the innovation depending on a potential adopter's economic, locational, demographic and social characteristics" (Brown, 1981:51).

In the resource management arena this concept has been applied to the availability of specific items of farm machinery associated with a resource management practice. For example, a need for local dealerships that offer the necessary tillage implements before promoting reduced tillage systems such as a Buffalo or ridge-till system. A similar example would be the availability of machinery items such as a rotary hoe before

promoting mechanical cultivation to reduce dependence on herbicides for weed control.

Infrastructure has also been applied, although less directly, to available technical, financial, and educational assistance. How much assistance of this variety available to farmers in an area will influence adoption decisions and diffusion patterns. It has not been a question of whether this assistance is available, rather the focus has been on the quality of that assistance. Diffusion patterns have been explained because of special cost-sharing programs, and "targeting" of additional technical and educational assistance.

3. Obstacles to Adoption

Many of the studies of the adoption process tended to view all new technologies as "improved", bringing only benefits to the adopting farmer. These studies often approached the adoption process in a promotional vein akin to agricultural change agents such as extension agents or agribusiness sales persons. Recent critiques of, and research into, the adoption process are more cognizant of the negative impacts that can also accompany introductions of technological innovations. In addition, many social, political and resource constraints have been identified that farmers often face when adopting new practices.

Unwillingness versus Inability to Adopt

The following hypothesizes reasons why farmers do not adopt agricultural technologies. The reasons for non-adoption can be placed into two general categories. A farmer is either unwilling or unable to adopt. These are not mutually exclusive categories in that a farmer can be able yet unwilling, willing yet unable or both. The reasons why farmers are unable or unwilling to adopt new technologies are often interrelated. Any one of these reasons could prevent adoption of a technology. The important point is that the farmer faced with any of these situations who chooses not to adopt is making a rational and correct decision. Risk plays a major role in the adoption process. It is important to keep in mind that from a behavioral perspective the perception of risk is real in its consequences. Coordinating all the activities and decisions necessary to operate a farm is full of risk. To ask a farmer to take on more risk by trying a new or unproven practice is often beyond what he or she is willing or able to accept.

Unable to Adopt

Farmers may be unable because information is simply lacking or scarce. This appears to be especially true for site-specific information. There may be problems with the quality of the information as well. That is, a farmer may not understand what is being communicated. This is often not the fault of the farmer. It may stem from the tendency for much of the information about new technologies to be academic and technical in nature. This places it beyond the comprehension of all except for those specifically trained about a technologies functions and application. On-farm demonstrations can be a very effective way to generate accessible, understandable information to farmers.

The costs of obtaining information about a technology may also prevent a farmer from adopting. Information is not free in that it requires time and effort to obtain. If these costs are too high a farmer may choose not to adopt. If an on-farm demonstration is within a reasonable distance and is organized to provide easy access to the pertinent information, than it can be a good way to reduce the costs of obtaining information.

The technology may be too complex in its operation or underlying principles. All things being equal, the more complex a technology is, the less likely it will be adopted. On-farm demonstrations by themselves cannot reduce the complexity of a technology. However, if a technology has been demonstrated on a farm, it may well have been adapted to reduce the complexity.

New practices can be too expensive for many farmers to adopt. On-farm demonstration cannot address this situation either. Yet if farmers have the opportunity to see how it works on an operating farm, they may be able to figure out lower costs alternatives.

If a technology requires significant additional labor it may be out of reach for many farmers. Farmers are often unable to provide or hire additional labor, either because labor is too expensive or unavailable. This can easily cause the practice to be rejected. There is little that an on-farm demonstration can do to address this situation directly, unless exploring labor-saving methods become part of the reason of the demonstration.

Incorporating a new practice into existing planning horizons may be problematic. There may be a mismatch between the two. The benefits of a technology may only accrue at a point beyond the current planning horizon. That is, a short term planning horizon may not accommodate a technology that requires a long term commitment for proper implementation or pay back. This especially true for entire farming systems. On-farm demonstrations have little potential to address this situation.

When a technology is adopted it is usually accompanied by a support network which assists the farmer in its implementation. Equipment dealers, extension agents and other farmers are examples of supporting mechanisms. The absence of or restrictions in such support make beginning to use a new practice more difficult. On-farm demonstrations can be serve as a support mechanism. The opportunity to meet and discuss with other farmers who are also evaluating the practice can be a good way to find these sources of support.

If a farmer realizes he or she does not have the necessary managerial skills to successfully take advantage of a new practice, the decision not to adopt is correct. On-farm demonstration cannot address a farmers lack of managerial skill directly. The knowledge of the required managerial skills may be enhanced however by observing and learning from demonstration activities.

A final and often overlooked reason why a farmer is unable to adopt is it may not be their decision to make. Bankers, landlords and other family members may be the ones who are actually the decision makers in a particular situation. If they are not convinced that a practice will work, they will not adopt the practice. Short of getting these individuals out to a field day, on-farm demonstrations cannot address this situation.

Unwilling to Adopt

Unwillingness to adopt can also arise for a number of reasons. A farmer may be unwilling to adopt because the information about the technology is inconsistent or simply conflicting. A good example of this is information about some of the reduced tillage systems. There exists inconsistent and conflicting information as to whether this method requires more herbicides, less or the same as existing tillage methods. Farmers usually do not adopt until they are reasonably sure of the results they can expect. However, on-farm demonstration can serve to clarify information conflicts by showing farm results in a local region. For example, demonstrating that prior weed populations often dictate the amount of herbicide needed under a reduced tillage system. Information inconsistencies or conflicts will remain. However, the whole-farm context of a properly run demonstration can clarify many of these inconsistencies or conflicts relative to a local setting.

The information about a practice may have poor applicability or relevance to a particular farm or farmer. Simply put the practice may not be "proven" as far as the farmer is concerned. One of the central purposes of on-farm demonstrations is to show how practices apply to particular farm types and farming regions.

Conflicts may exist between the current production goals and the new practice. The production goals can be influenced by government policy, family values and economics. If a practice does not accommodate these goals it will most likely not be used. Many practices have relatively narrow production parameters under which they operate. Instead of assuming that farmers must adapt their operations to fit the technology, adoption would increase if technologies were sufficiently flexible to fit into a wider range of farm situations. While on-farm demonstrations cannot directly address goal conflicts, they can illustrate adaptable solutions to this situation.

The farmer may also be simply unaware of the practice or those promoting it. Another dimension of this constraint is when they may not have had the opportunity to learn about the basic economic or agronomic facts of the practice. While on-farm demonstrations can serve to create awareness of a practice, this is not expected to be one of its most effective functions.

A promoted practice may be inappropriate to the physical setting. For example, many practices developed in the flat, fertile lands of the Midwest may not be appropriate to many other regions of the nation. Any form of information and education efforts are likely to fail when promoting technology inappropriate to the physical setting. At best, on-farm demonstrations can only show that a perceived inappropriate practice is in fact appropriate.

If a practice increases the chances of negative outcomes, perceived or actual, farmers will be reluctant to adopt. If, for example, a practice is more prone to the vagaries of the weather or markets it increases the risk of negative outcomes. A critical question is whether the risk and uncertainty is inherent in the practice or due to inadequate information and support. The on-farm demonstration can do little in regard to a practice that increases risk other than demonstrate the parameters and conditions of the risk. However, it can reduce risk by providing needed information and assistance that reduce the probability of negative outcomes.

Finally, a farmer may simply be satisfied with traditional practices, especially those that have served well in the past. It is important to remember that many "traditional" farmers are still in business while many of their more "progressive" or "innovative" neighbors have long since gone out of business. On-farm demonstration may only be able to address this situation indirectly by presenting a more convincing argument as to why the promoted technology is superior to the traditional one.

4. Demonstrations and Constraints to Adoption

The question of how well on-farm demonstrations can address

these constraints has received little attention. This is especially true in light of the current interest in this method. It would not be expected for the on-farm demonstration method to address equally well all reasons for non-adoption. If on-farm demonstrations are being planned, used or evaluated, then understanding the strengths and weaknesses is required. Thinking about the relationship between on-farm demonstrations and constraints to adoption will assist in this regard. The previous discussion provides a starting point for systematically analyzing this relationship. Figure 2.2 lists the constraints to adoption outlined above and then hypothesizes as to the relative degree to which on-farm demonstration would be expected to address them. This scale does not take into consideration all the variables of location, persons involved, type of technology being promoted or target audience. As noted, all of these factors have a tremendous impact on the success of the demonstration effort.

Figure 2.2

Ability of On-Farm Demonstration to Address Constraints to Adoption

OF SOURCE OF CONSTRAINT	NATURE OF CONSTRAINT	SUITABILITY[2] DEMONSTRATION RE CONSTRAINT
	Unable to Adopt	
Information	Lacking/scarce	Excellent
Information	Costs to obtain high	Excellent
Technology	Too complex	Fair
Technology	Too expensive	Poor
Farm Labor	Limited/unavailable	Poor
Technology	Planning horizon mismatch	Poor
Infrastructure	No support system	Good
Managerial Skill	Lacking/learning costs high	Good
Decision Control	Farmer not decision maker	Poor
	Unwilling to Adopt	
Information	Inconsistent/conflicting	Good
Information	Not applicable/relevant	Excellent
Technology	Goal conflicts	Poor
Technology	Unaware of technology	Fair
Technology	Inappropriate to setting	Poor
Technology	Increased negative outcomes	Fair
Technology	Satisfaction w/traditional	Fair

[2] Suitability is a subjective scale and ranges from poor, fair, good to excellent. The value on the scale is derived after assuming a well-designed demonstration regarding the dimensions discussed (i.e., accessibility, representative of farm/farmer, etc.).

A way of summarizing this discussion is to note the fact that the terms on-farm demonstration and on-farm research are often used interchangeably and incorrectly. On-farm demonstration has been described as a term which may describe many different kinds of activities with variation in functions, farmer involvement, level of analysis, accessibility, and acceptability of the host farmer.

The idea of specifying and knowing the target audience is central to a successful on-farm demonstration effort. A demonstration cannot be expected to be relevant to all farms in an area unless it is first determined there is significant homogeneity among these farms. This, however, is unlikely. Consequently, planning an on-farm demonstration first involves segmenting the general farm audience into relevant groups, and then designing the demonstration for one specific target audience.

The outlined dimensions of on-farm demonstrations all have impacts on the effectiveness of the demonstration. Yet these crucial aspects are rarely acknowledged, and too often on-farm demonstrations proceed along the path of least resistance. That is, past cooperators are often selected as demonstration farmers because this is most convenient to the organizing researchers or agency personnel.

Presumably on-farm demonstrations are chosen over other knowledge dissemination methods (print or electronic media, meetings, farm-visits, etc.) because they are deemed to be more effective. Yet there has been little analysis on how to evaluate the effectiveness of a on-farm demonstration effort, or to compare the effectiveness of this approach to other dissemination techniques.

Farmers do not adopt new practices because they are unable, unwilling, or both. The many reasons behind farmers' inability or unwillingness to adopt are often rational and correct. Well-designed on-farm demonstrations have certain qualities that make them suited to address certain obstacles to adoption. Likewise they cannot be expected to address all the various constraints to adoption.

It is important to recognize that on-farm demonstrations are more than simply "demonstrating" a practice in a farm setting. If on-farm demonstrations are to play a larger role in the future, then it is essential that those involved begin to develop a basic understanding on how to design, conduct, and evaluate these demonstration efforts.

C. COMMUNICATION PROCESSES

1. Overview

The adoption research literature discussed in the previous section establishes a critical linkage between communication strategies and successful adoption programs. More specifically, different sources and types of information become more effective at different stages in the adoption process. For example, mass media have been found very effective in creating awareness of a new practice, but relatively ineffective in promoting evaluation of the practice. The implication for this project is that we must be capable of identifying sources of information and assistance by the stage of adoption for individual farmers. That is, we must specify the relative importance and influence of these different sources as individuals move through or are retarded in the adoption process. Such data can identify situations where the information or assistance process is breaking down as individuals reach a certain stage in the adoption process, but go no further. This type of information is needed to strengthen the content and delivery in these water quality demonstrations and in such subsequent programs.

Another implication is the realization that farmers involved in these demonstration projects are not operating in an information vacuum. The local demonstration project will be only one of many different, often conflicting sources of information. A critical evaluation component is whether the demonstration project was designed with this fact in mind. That is, are the project communication efforts designed to complement rather than compete with these other information sources? In essence, the research must evaluate the extent the demonstration project was designed as a public rather than private campaign.

Compounding the problem is a lack of consistently rigorous previous research on the information environment of farmers, the kinds of channels they are exposed to, and the kinds of channels they seek out for specific purposes. In this section we begin with an overview of that previous research, drawing inferences when possible from the more successful studies, and indicating more frequently gaps in that literature base. We then attempt to impose a more coherent schema to the demonstration projects by considering them as variants on public communication campaigns. These can be regarded as attempts by one group to influence other groups' knowledge, attitudes or behaviors by using specific media channels and messages (Paisley, 1989). We summarize previous findings and recommendations on more effective conduct of such campaigns, and relate those more directly to demonstration projects.

2. Producers' Communication Patterns

Although communication plays a vital role in agricultural production and marketing, we have little consistent or generalizable empirical evidence about farmers' information sources or how they use them. Literature reviews turn up relatively small numbers of studies conducted about the communication patterns of U.S. farmers. Of these, many have been conducted with specific agronomic topics that restrict the ability to generalize to farmers' general information seeking patterns and their use of different channels.

Not only are the previous studies confined to specific areas of agricultural practices, but many are restricted geographically. Inconsistent, as well as small, sample sizes and responses rates limit the generalizability of these even more. Equally important, high variability is found in the operationalizations of key concepts. For example, the sources of information messages, e.g. USDA agencies, and the channels that convey them, e.g. television, are often confounded. And, such diverse constructs as information seeking by farmers and their exposure or attention to information are sometimes not suitably distinguished. Central concepts such as credibility tend to be unclearly measured, and/or lumped with measures of the utility or practically of an informational message. Also, much of the research has become dated with recent changes in the makeup of agricultural communication networks and the technologies they use (cf. Yarbrough, 1990).

Communication and Adoption

Some of the more productive work on agricultural communication focuses on the adoption and diffusion of new practices and technologies. This literature at the least has the benefit of being tied to an arching theoretical framework. A general hypothesis suggests that adoption by farmers is accelerated the more closely they are tied to information channels and networks. While most evidence seems to support this (cf. Rogers, 1983; Nowak, 1987), a dissident view is that economic factors, e.g. financial incentives, are more critical (e.g., Pampel and van Es, 1977). Indeed, studies reporting null effects for information orientations on adoption are markedly few (cf. Abd-Ella et al., 1981; Rogers, 1983; Albrecht and Ladewig; 1985).

Another prediction is that mass communication is relied upon more during awareness, information and evaluation stages of adoption, while interpersonal communication is used more for trial and adoption (Lionberger and Gwin, 1982; Rogers, 1983). However, actual findings on types of sources used by U.S. farmers

in the adoption process indicate considerable variation depending on such factors as:

a. Adoption characteristics of the practice, e.g., complexity and profitability (Nowak, 1987; Thomas, 1990). A key issue here is how appropriate and suitable various communication sources are for different objective adoption characteristics, as well as ones perceived by farmers. Simpler low-risk practices may be conveyed though adoption by broadcast media, for example, while more complex long-term changes may require repeated interpersonal interaction, demonstration farms, and the like.

b. Availability and accessibility of information and channels (Mason, 1964; Yapa and Mayfield, 1978; Lionberger and Gwin, 1982; Rogers, 1983; Grunig et al., 1988; Thomas, 1990). Questions arise of how to increase the availability to more farmers of Extension, SCS, and related personnel and materials. Media dependency theory (Ball-Rokeach, 1985) predicts that choices of media vs. interpersonal communication are in part functions of social structure and conflict. A parallel issue involves a hypothesized "knowledge gap," by which the already more informed become even more so because of unequal distribution of or access to communication resources.

c. The utility, practicality and credibility of the information provided (Lionberger and Francis, 1969; Rogers, 1983). Research on adoption and diffusion, as well as more mainstream communication effects studies of the public overall, suggests that audience perceptions of how well various media and messages suit or "gratify" their needs is a critical variable in assessing communication impact (cf. Rosengren, Wenner and Palmgreen, 1985). This view encompasses audience members (in this case potential adopters) as more active and involved individuals seeking information to make appropriate decisions, rather than as passive targets being acted on by various change agents. A corollary is that farmers choose sources and channels on the basis of expectations about how those will serve their informational needs. Many of those expectations are based on previous experiences.

d. The appropriateness of timing of the information given the adoption stage (Mason, 1964; Rogers, 1983; Blum, 1990). Strategies for reaching the right farmer at the right or "teachable" moment with the right medium require more research attention. Blum, for example, found "worth" kinds of knowledge added to "how to" information to be important in the evaluation or persuasion stage.

e. Socio-economic and structural characteristics of producer and farm (Wilkening, 1950; Brown, 1981; Nowak, 1987; Anosike and Coughenour, 1990; Thomas et al., 1990). Indications appear of better educated and/or higher socio-

economic strata and/or more organizationally integrated farmers having access to more information sources, especially more effortful or costly ones. Communication patterns have also been found to vary by education, experience level, and size and type of operation.

f. Position of the farmers in the diffusion chain. (Lionberger and Francis, 1969; Brown, 1981; Thomas, 1990). The location of producers as early vs. late adopters and finer distinctions can set the context for what kinds media and message formats may be most appropriate and effective.

This evaluation study will address the above points in subsequent and more extensive data analyses. We turn below to some of the more descriptive research on overall producer media and interpersonal communication habits.

Producers' Uses of Mass Media

Ideal measures of producer exposure to mass media would include viewership, readership, or listenership frequencies for general television, agricultural television, general newspapers, agricultural newspapers, general magazines, agricultural magazines, general radio news programming and agricultural radio programming. However, most studies that have been completed focus on general categories of print media, radio, television; or have been selectively looking at only the aspects of one type of media. Outlined below are some of the more general findings for each major type of agriculturally pertinent mass media.

Agricultural magazines. General and specialized agricultural magazines typically appear as the most mentioned source of media information by farm operators. Over 50% of the Georgia farmers surveyed by Weaver & Miller (1982) received three to five magazines regularly. Fett & Mundy (1990), in a study of 246 Wisconsin farmers, found 90% used farm magazines as sources of information.

Scherer & Yarbrough (1984) found nearly two-thirds of Iowa farmers often use general farm magazines for information about farming and almost one quarter often use specialized farm magazines for information about farming.

Farm magazines were also found to be the "most important" source of information to farmers (Adams and Parkhurst, 1984). Magazines have also been reported as the first source of information for learning about new products (Anon, AgriMarketing, 1983, 21(9)). Farm magazines rated second to agricultural newspapers for Wisconsin farmers, in a finding perhaps more indicative of a strong statewide farm newspaper readership (Fett & Mundy, 1990). Hallman (1982) found 81% of farm Extension users

ranked the farm press as one of the top three places they would turn to get agricultural information. Extension agents ranked first at 82%.

Agricultural newspapers. Specialized agricultural newspapers have really just come into their own in the past decade, and they tend to be stronger in some states or regions (e.g., the upper Midwest) than in others. IOWA FARMER TODAY, ILLINOIS AGRI-NEWS, and AGRI-VIEW are a few examples of agricultural newspapers. They carry a variety of information including market reports and outlooks, state extension information, variety trials, and financial information. Fett & Mundy (1990) found that 90% at least occasionally received information about farming from them, tying their viability to Wisconsin farmers with that of farm magazines.

General newspapers. Two kinds of general newspapers are available in farming communities. The first is the daily newspaper that contains predominately local news about municipal, regional, or state actions. Some of the older, more traditional daily newspapers still have a farm reporter and farm page, but their responsibilities have grown to include chemicals and natural resource information. Generally, a relatively small amount of the total news hole is given to agricultural concerns. Therefore, it seems only logical for farmers not to turn to general newspapers for information about production, management, or finances.

The second type of general newspaper is the weekly publication that contains mainly local information. Sometimes, the county extension agent writes a column for this publication, but most of its agricultural reporting is about the winners of production contests or the local county fair. This newspaper is generally seen as an entertainment vehicle and not a place for obtaining production, management, or financial information.

Farmers appear little different from the general population in their readership. Reading the newspaper seems to be one of those things you either do with great interest or you don't do at all. Over half read a newspaper at least three times a week, but one out of 10 never touched a newspaper. (Weaver & Miller, 1982). However, producers also may use newspapers for specific information about farming to some degree (Scherer & Yarbrough, 1984).

Television. Producers can be expected to watch television for news and for entertainment, but not to a great extent for agricultural production news. Since farmers are a small share of nearly all broadcast market areas, few stations offer more than early morning market reports and outlooks and possibly a noon farm report. However, given the more limited entertainment

options in most rural areas, farmers may use television more than their urban counterparts for entertainment. This becomes even more likely with the advent of video cassette recorders and satellite dishes.

One marketing study (Anon, 1985, AgriMarketing) indicates farmers viewed more news and television overall than the average men in the marketplace. Farmers watched more early morning news (6:00 to 9:00 a.m.), more noon news (noon to 12:30 p.m.), more early news (6:00 to 6:30 p.m.), and more prime time (7:00 to 10:00 p.m. CTZ, 8:00 to 11:00 p.m. ETZ).

Hallman (1987) found nearly three-fourths of farmers watched local news programs regularly, while 21% said they tuned in occasionally. Seventy-six percent watched during the early evening newscast. Hallman also found they used broadcast news (both radio and television) for information on weather (89%) followed by market reports, and farm legislation. Scherer & Yarbrough (1984) found that almost 60% of farmers in their sample sometimes used television programs for information about farming. A commercial media study found 40% watched three to five programs weekly, while 22% watched only one or two (Anon, 1981, Agri-Marketing). Over three-fourths watched the late evening news, especially the weather.

Weaver & Miller found almost 60% of farmers had not watched any farm news program on the television. Of the farmers who had watched one or more farm news programs each week, 70% watched from 5:00 to 10:00 a.m., the typical time slot allotted to farm market news and outlooks.

Radio. Radio would appear attractive to farmers for its mobility and timeliness, and somewhat greater attention to agrinews and information in more rural areas. For perishable information such as market prices, radio can have high utility. However, for details, figures, and facts required to provide production, management, or financial information, radio is not optimal. In one study, over 60% of farmers listen to radio farm market reports every day and an additional 21% "tune in" nearly every day (Might, 1988).

Weaver & Miller (1982) found that 52% of farmers listened to one to five farm news programs per week, however, 38% never heard any farm news programs in any given week. Fett & Mundy (1990) found 60% of their Wisconsin farm respondents used the radio to gather agricultural information. Scherer & Yarbrough (1984) found 50% of Iowa farmers sometimes use radio for information about farming. Hallman (1982) found approximately 80% of Georgia farmers listening to the radio in trucks and at home in the morning hours and over the noon hour.

Agricultural newsletters. Farm newsletters have been particularly neglected in the research literature. These include a variety of publications emanating from state and county Extension and conservation offices, agribusiness firms, special interest groups, and private consulting or publishing groups. Most are mailed free, but several come at relatively high cost and attempt to provide farmers with exclusive production or market information they might not easily get elsewhere. Newsletters can be advantageous because they can use the benefits of direct mail lists to reach specialized groups of producers with relevant information.

An extensive study of agricultural Extension newsletters in Wisconsin found them widely read, with quite high utility ratings (Fett et al. 1991). They tended to be more read by farmers who were also tied to organizations the newsletters were specifically aimed at. Weaver and Miller (1982) found newsletters to be the most widely used "specialized" farm information source. However, Scherer and Yarbrough (1984) reported that private newsletters were never used by about half of Iowa farmers, with 30% "sometimes" using one. The farm restructuring of the early 1980s, along with increasing postal costs, may have reduced the viability of private newsletters in particular. More research is needed on differences in readership of private vs. public ones, and on their respective impact.

Interpersonal Communication

Media sources obviously account for only a fraction of the information producers receive daily, with another large share of it coming from people they know or work with. Just how much and what kinds of information is more likely to come from interpersonal conversations is open to question, however. Potential sources are multiple and interactive. More commonly listed ones include family, friends and partners; other farmers in the community; other farmers with similar interests outside the community; landlords; tenants; Extension, SCS, and allied agents, specialists and personnel on the Federal, state and county levels; commercial dealers, agents, sales representatives, field personnel, maintenance and repair personnel; cooperative representatives; processors; lenders and lending agents; and privately hired consultants. Ties with agricultural organizations and church and community groups may result in more formalized communication patterns as well.

Weaver and Miller (1982) found the 90% of farmers identified people with special knowledge such as extension agents, university specialists, and other farmers as important sources of information. A Michigan study reported 66% of farm families reported getting production information from friends, and another 53% from agribusiness dealers and salesmen. (Andrews,

Thompson, Vuylsteke, & Berry, 1982). However, Jones, Sheatsley, & Stinchcombe (1979) found personal conversations with either business contacts or friends were most important for only 6% of the respondents. Pounds (1985) found across urban, rural, and rural/urban groups, the most frequently cited sources of information were professionals or business associates. The active information seeker first looked to the professional or business sources and then to the mass media. While Fett and Mundy (1990) found 40% of Wisconsin farmers believed farm consultants were an important source of information. (The authors also note that farmers gave a broad definition to the term to include bankers, company salesmen, and fieldmen.)

Extension, SCS, and related organizations of course provide both interpersonal and mass media information. Much of the attention of farmers to print and broadcast media is likely tied at least in part to Extension's use of those channels in particular. Studies suggest farmers have far more contact with Extension though media than in person (Steele, 1979; Warner and Christenson, 1984; Fett et al, 1991). Andrews et al. (1982) found 88% of farm families reported contact with Extension in some form. The most likely contact with Extension was by receiving a publication (73%), receiving the Extension newsletter (66%), listening to an Extension radio, television program (64%), visiting the county extension office (55%), and talking to the county agent on the telephone (48%). Jones et al. (1979) found Extension, SCS and other agents the second most useful source of information for crop and livestock information, with USDA and other government documents rated first.

Weaver & Miller (1982) asked farmers to rank information sources of production and marketing information. Mass media and "special sources" were extremely important to over three-fourths of those surveyed, but over 90% of farmers said "people with special knowledge" were extremely important. On the other hand, Hallman (1982) found private consultants to be ranked as the least important place to get information, followed respectively by farm equipment salesmen, cooperatives, and television.

Differences in Producer Communication Patterns

Farmers have been found to vary in their communication habits by such factors as experience, enterprise size and type, the nature of decisions being made.

Experience. In a sample of operators of somewhat-larger-than-average farms, Ford & Babb (1989) found differences between farmers information sources depended on their years of experience. More experienced farmers relied more on cooperatives for grain sales information, while the less experienced tended to use commercial newsletters and commodity brokers. In livestock

sales, the use of USDA news and private firms increased with farming experience. Also, with more experience farmers used fewer information sources he used. Less experienced farmers used family and friends for livestock information. With respect to buying inputs, more experienced farmers used cooperatives in fertilizer purchase decisions and the Extension service for information about chemical inputs.

For information about cropping and CRP decisions, more experienced farmers relied on the Extension service while younger farmers depended on family and friends. Less experienced farmers also called on family and friends more for information about credit. The more experienced farmers relied more on banks.

Farm size. Weaver & Miller (1982) found larger farmers generally considered price information, production factors, and other information sources more important when making production and marketing decisions than did smaller farmers. Education was higher among the smaller farmers, however. An unexpected negative relationship was found between increased farm output and the importance of mass media as a source of information for making production and marketing decisions.

Jones, Batte, & Schnitkey (1989) found differences in the use of information sources based on farm size by enterprise. When farmers who raised both livestock and crops were asked about general information sources such as newspapers, radio, extension and other farmers, smaller farmers (less than 500 acres) ranked the local newspaper more useful than larger farm operators did. Larger grain farmers relied more on the general information sources of national newspaper, television reports and extension.

In ranking specialized sources such as specialized farm magazines, newsletters, computerized information, and lenders, larger livestock and crop farmers (500 acres or more) said commercial newsletters, computerized information services, and brokerage firms were more useful. In addition to using the same media as larger livestock and grain farmers, the larger farmers who raised only grain used specialized farm magazines and specialized information sources more than smaller farmers.

Type of operation. In general, Ford & Babb found that livestock farmers rely on a broader range of information sources than do crop farmers. However, private firms and cooperatives were the most significant disseminators of information for both types of farmers. About 50% chose one or both as an important source of information. Farm magazines and the Extension service were used more for decisions about buying fertilizer and chemicals than feed.

Market reports have also been found to be significantly more important to farmers with livestock enterprises than to those who

raised primarily crops or who were diversified (Adams and Parkhurst, 1984). Livestock breeders said market reports were more important for providing them with change information. Crop producers said magazines were the superior channel for obtaining information.

Ford & Babb also found that those selling commodities (grain and livestock), cooperatives, private firms, commercial newsletters, and commodity brokers were rated the most important information sources. The larger the farm, the higher the reliance upon brokers and commercial newsletters. Smaller farm operators were more likely to use other farmers and family or friends for information. For livestock sales, private firms were used more than any other information source.

Nature of decision. Ford and Babb also found variation with type of decision. For buying inputs (feed, fertilizer, or chemicals), farmers used private firms and cooperatives as the primary source of information. For crop decisions, however, family and friends were primary, followed by other farmers, private firms, and Extension. The smaller farmers in this sample used Extension and farm magazines more than did larger farmers. Investment and credit decision information were sought primarily from banks and family members.

For information about broadly defined environmental issues, Bruening (1990) found farmers rated Extension agents as the most useful of eight information sources. Local chemical dealers, the Soil Conservation Service, neighbors and friends, and the Extension specialists were also highly rated. The least useful sources of information were vocational agriculture teachers and machinery dealers. The highest rated ways to receive information were through field demonstrations and county and local meetings. The next most useful were magazines, printed materials, fairs, and photographs. The least helpful were radio and on-farm consultation and discussions.

As for other factors, Jones, Batte, & Schnitkey (1989) found support for their hypothesis that sole farm ownership, off-farm employment, college education, and dairy enterprise specialization would have a negative impact on general information demand. They also indicated that their specialized information sources were defined too broadly.

Adams & Parkhurst (1984) also found that farmer ratings of the importance of information sources varied depending on where farmers believed research relevant to them was being generated. Those who believed that commercial research and university laboratories were generating more salient research tended to place a higher premium on Extension publications and staff.

3. Public Communication Campaigns and Demonstrations

The problems identified above with respect to gaps in our knowledge of producer communication patterns can be alleviated in the present project by: (a) including in our evaluation plan formative research aimed at carefully delineating the communication orientations of farmers targeted by the demonstration projects; and (b) tracing farmers' use of demonstration project communications and the impact on adoption.

These two approaches, however, are only part of a larger, more well-developed plan to sharpen our perceptions of this water quality BMP adoption process by viewing it in the context of public communication campaigns. This perspective permits the application of a wide body of research literature from the communications, field social psychology, marketing, and journalism. Although this literature has been applied only minimally to agricultural issues in the past, it holds significant potential for contribution to knowledge of adoption processes.

Public Communication Campaigns

Communication or information campaigns in general: (1) intend "to generate specific outcomes or effects (2) in a relatively large number of individuals, (3) usually within a specified period of time and (4) through an organized set of communication activities" (Rogers & Storey, 1987, p. 821). While public information campaigns share common interests in informing and influencing the citizenry, they often go about the job in widely varying ways depending upon the type of problem or issue being addressed and the specific campaign objectives (Paisley, 1989). Other factors affecting campaign strategies include the characteristics of their target audiences, and the time and money available for the effort (O'Keefe and Reid, 1990). Most such projects attempt to combine public information or media publicity campaigns with community participation and training activities (Flora et al., 1989). Media tend to be more effective at building citizen awareness of an issue, while complex attitudinal or behavioral changes are apt to be accelerated by more direct forms of citizen contact and intervention (Rogers and Storey, 1987).

The development of successful informational and promotional programs in agricultural, environmental and other issue areas remains part art, part science. Even the more well-wrought efforts depend upon diverse and often scattershot approaches for reaching their audiences (Grunig, 1989; Salmon, 1989). Equally important, the programs are typically difficult to evaluate in terms of having achieved their goals. At least commercial advertising or marketing campaigns can work with some kind of

"bottom line" sales or response figure as a criterion, public campaigns often need to rely on more obtuse and distant indicators, e.g. numbers of deaths from heart disease, rate of traffic accidents, or physical indicators of environmental pollutants. The criteria for success or failure of these campaigns are often vague.

While more formal evaluations are increasing, they tend to be of low order scientific validity. Tight experimental controls are seldom used, largely because of the cost and complexity of implementing them in "naturalistic" field situations. Another difficulty in assessing even the most productive campaign evaluations is that the criteria for success are typically statistical tests of hypotheses, and little account is taken of the power of those tests in allowing generalizations concerning the "real world" impact of the messages. While it is helpful to know that attitudes toward topic "X" changed "significantly" following exposure to a campaign, the unanswered question that too often remains is how many individuals were affected, and to what extent. Such data are important to credible estimates of the cost or effort efficiency and effectiveness of campaigns.

Campaigns related to agricultural environmental issues pose special problems. Several of these are discussed in the previous section as barriers to adoption. Others fit under the umbrella of what Weinstein (1987) calls self-protective behavior. This construct encompasses anticipatory reactions to natural and occupational hazards, as well as more personal health and safety risks. Weinstein identifies the key predictor variables in precautionary behaviors as including beliefs about the probability and severity of the harm; the efficacy of a precautionary action; and the cost of taking action. Persuading people to increase such actions can be difficult, in part because of complex interactions among the above factors. Also, as Rogers and Storey (1987) note, programs advocating the adoption of behaviors to help "prevent" a potentially unpleasant event in the future tend to be less successful than those offering more timely and obvious rewards.

Adding to the problem is that the salience of water quality, and perceived efficacy of protective behaviors, may to vary considerably across geographic, producer, and related characteristics. This heterogeneity calls for more careful -- and more effortful -- targeting of messages to specific subgroups for greater effect.

The Scope of Public Communication Campaigns and Programs

A multitude of communication campaigns and other promotional efforts have been developed over recent years aimed at influencing citizens' knowledge, attitudes and behaviors on a

host of social and political issues. While all share common interests in informing and influencing the public, they often go about the job in widely diverse ways depending upon the type of problem or issue being addressed, the specific campaign objectives, the characteristics of their target audiences, and the time and money available for the effort. In general, however, most such programs attempt to combine public information or media publicity campaigns with community participation and training activities, much as is the case with the USDA demonstration projects. If just "getting the word out" is the main mission of the program, more reliance on media alone is required. On the other hand, if goals include more complex attitudinal or behavioral changes, they are apt to be accelerated by more direct forms of citizen contact and intervention.

These campaigns are typically underfunded, at least in comparison to their immediate competitors for public attention: the multi-dimensional public relations and advertising campaigns of the private sector corporate world. They often depend a great deal on the work of volunteers and goodwill in-kind contributions by media and other business organizations. For example, a common component of programs involving media are public service advertisements, which are often produced with the assistance of local media and aired or displayed _gratis_ by broadcast stations, newspapers and magazines.

Strategies for Increased Campaign Effectiveness

Nevertheless, some qualified generalizations can be made about certain strategies which appear to have had more success than others. In their review of the influences of public service advertising, O'Keefe and Reid (1990) comment on several factors that appear to make for more effective public-sector campaigns in general. Emphasized here are those that may be particularly relevant to producer adoption of water quality BMPs.

1. _The more recent successful campaigns have incorporated theoretical models of communication or persuasion into their development_. Centering a campaign around a theoretical approach not only allows a broad base of knowledge to be brought to bear on the problem, but it also provides a guiding model or structure which can help order the sometimes complex and disorganized components of contemporary campaigns. A classic example of this approach is the successful Stanford Heart Disease Prevention Program (Maccoby et al., 1977; Maccoby and Solomon, 1981), which includes perhaps the most extensive and methodologically rigorous self-evaluation to date. In brief, the objective of the campaign was to reduce heart disease risk among certain normally high-risk target audiences by informing them via mass media and personal interventions of the precise nature of the risks and attempting to reduce their riskful behaviors.

The campaign was based extensively upon Bandura's (1977) model of social learning theory which holds that new actions are learned by imitation or modeling of specific acts of others and solidified through selective interpersonal support and reinforcement. The approach further avers that new behaviors acquired from mediated sources are unlikely to be performed unless the environment is one in which they can be reinforced. Another approach incorporated into much of the campaign was that suggested by Cartwright (1949), who proposed that while media campaigns can inform and may alter attitudes, interpersonal communication and persuasion make actual behavioral change more likely to occur. The program used preliminary, formative research to identify higher heart disease risk groups and then pegged appeals toward their specific conditions.

"Before and after" evaluative surveys and comparisons with a control community provided convincing evidence that the media campaign combined with the interpersonal programs and workshops produced significantly improved health habits. Used alone media also produced significant changes in knowledge of risk preventive methods as well as in actual behaviors.

2. As an extension of the above points, <u>successful campaigns are also more likely to have a clearly delineated set of operationalized campaign goals</u>. Planners need to specify at a minimum what kind of impact goals are being aimed at, including the possible options of awareness, information gain, attitude change, motivation, and behavior change. Criteria should be established at the outset to allow subsequent judgement of the "success" or "failure" of a campaign.

Perhaps most important is the development of unambiguous objectives for each component and stage of the campaign, and translating these objectives into clear message components. Care should be taken to assure that the goals are realistic. No one campaign will eliminate heart disease or child abuse, but messages can emphasize quite specific short-term steps which individuals can take to help alleviate the situation.

It is indeed possible to include a great number of highly specific subgoals, each of which can be attended to some extent in the design of a campaign. Flay (1981), for example, has suggested a progressive list including: (1) Exposure; (2) Awareness; (3) Knowledge; (4) Memory; (5) Opinion or belief change; (6) Retention of those; (7) Attitude change; (8) Persistence of those; (9) Behavioral intentions; (10) Resistance to same; (11) Behavior change; and (12) Maintenance of the change.

On a more applied level, a construct of <u>competence</u> has been found useful for evaluating public communication campaigns concerned with building citizen "competence" at something,

including health care, nutrition, traffic safety and the like. Here, we may concern ourselves with how well the demonstration projects increase producer competence with respect to water quality-related BMPs.

The variables included under the rubric have been used as dependent variables in various persuasion-social influence models. To the extent that farmers are more competent in their adoption of the BMPs), they: (1) are more <u>aware</u> of or knowledgeable about how to perform; (2) hold more positive <u>attitudes</u> regarding their own abilities as well as the value of such actions; (3) feel more <u>capable</u> in acting effectively; (4) are <u>motivated</u> to act; and (5) <u>engage</u> in action. A sixth might be how well they can effectively evaluate their performance, adding something of a feedback loop.

This approach was used in an evaluation of the Advertising Council's national "Take a Bite Out of Crime" campaign, demonstrating that it had a significantly positive impact on citizen awareness, attitudes, and activity with respect to crime prevention (O'Keefe, 1985; 1986). It seems likely that many other campaigns are essentially directed at such competence building, whether in health, safety, or other pursuits, and the same dimensions noted above may be applicable to them.

This perspective differs from most persuasion models in that it does not assume linear levels of effect: individuals, for example, have high behavioral competence without necessarily being high on attitudinal, or informational, competence. Campaigns may aim to affect competence at each of the different levels, although behavioral competence is usually the end goal. The research on the effects of the crime prevention campaign, for example, found that it had attitudinal effects on some individuals without necessarily increasing their information levels. For other people, it stimulated behavioral changes without necessarily bringing about changes in attitudes.

This general use of competence has been a useful device in the past for explaining evaluation goals and results to campaign planners. As used here, it could complement the adoption process model (awareness-knowledge-evaluation-trial-behavior). While one can argue that behavioral change is usually the most highly desired outcome of any campaign effort, there are instances in which changes on other dimensions of competence can have important impact. Increases in informational, attitudinal or especially motivational competence may increase the probability of behavioral changes occurring when appropriate circumstances are present. Moreover, even in instances in which the desired behavior is being carried out, strengthening other dimensions of competence is likely to lead to a sense of greater congruency with respect to the issue at hand and a concomitant reinforcing of the behavior. One may regard an "ideal" state of

competence with respect to a given issue as one in which an individual is at the maximum in terms of knowledge, favorable affect, sense of capability, motivation and action.

Adoption of evaluation paradigms such as competence can also help resolve the related problem of the lack of comparability of evaluation evidence across campaigns. Little standardization of conceptualizations or of research designs is found, making it quite difficult to offer generalizations from the results of one campaign to another.

3. <u>The more influential campaigns have made extensive use of basic advertising and marketing planning in their design and execution</u>. These include such rudimentary design elements as concept testing, focus group analysis, pretesting of campaign materials, and tracking the dissemination of campaign materials.

As Atkin, Garramone and Anderson (1986), Bauman (1988), and others have indicated, inherent in successful campaign efforts is a realization that each kind of audience is going to have special characteristics and needs, and that these have to be considered in campaign designs. Campaign effectiveness appears in large part tied to: (1) How narrowly individual target audiences can be defined; (2) How much information about each of those audiences can be gathered prior to the campaign; and (3) How well that information can be utilized in the design of a campaign. As Kotler and Andreasen (1988) suggest in their "social marketing" approach to public service campaign programs, such a systems-oriented format forces immediate concern during the planning stage with specific goals or end-products to be achieved. The approach increases the probability of a more appealing and attractive "product" in the form of campaign themes and messages particularly tailored to the target audience. This audience segmentation step can be critical:

> "Audience segmenting is the process of breaking down the mass audience into a small number of subgroups that are internally homogeneous as possible and as different from other groups as possible. This enables the campaign planner to allocate particular elements of a campaign to meet the needs of each particular group. Any single campaign attempting to change all the groups with the same message or channels will probably fail miserably." (Solomon, 1989: 96-97)

4. A corollary is that <u>campaigns are likely to be more successful if their design takes into account not only existing audience awareness, attitudes and behavior, but their communication environments and patterns as well.</u> A wealth of previous research on source, message and channel factors in

influencing audiences provides a substantial resource for campaign planners intent upon matching messages to particular audiences. Sources of special interest to public communication campaign strategists include Percy and Rossiter, 1980; Roberts and Maccoby, 1985; Rice and Atkin, 1989; O'Keefe, 1990; Reardon, 1991). Elements such as source credibility, fear appeals, use of humor, elements of message design, and channel information capacities have all been the subject of considerable research, and many of the findings have implications for media message design. As we have seen, formative research can also present profiles of the mass and interpersonal communication patterns of specific target groups, as well as address their motives for communicating and the kinds of gratifications they seek from doing so.

Several elements involving the dynamics of the intended audiences of programs also need to be accounted for if informational programs are going to have a higher probability of success. One, it appears that campaigns have more of an impact when they ride on a wave of ongoing public opinion or concern. The "Take a Bite Out of Crime" campaign, for example, had the advantage of being disseminated during the highly crime conscious early 1980s. There was extensive news coverage about crime in general, and public opinion polls often listed it as the "Number One" problem in the minds of most citizens. The campaign could therefore play off against the existing climate of opinion, reinforcing it and in turn being reinforced by the public interest in crime. The influences of the campaign might have been less had they appeared in a vacuum with little or no other media coverage or public concern.

Another anecdotal example of this opinion synergy may be that of the case of drunk driving. Countless national and community level campaigns began against drunk driving during the mid-1980s. These were augmented by heavy doses of public service advertisements offered by the national television networks, often in prime time. News coverage was been extensive, in part the result of legislative efforts in many states to increase the severity of punishment for the crime and/or raise legal drinking ages. Tavern and liquor store owners have become far more conscious of their own legal responsibilities. Only scant formal research was carried out of the consequences of all this activity, but it seems arguable that the issue was certainly much more in the public eye. The role played by actual "campaigns" here would be extremely difficult to analyze, but it again seems arguable that they may well have been an integral part of the mix of building public awareness and concern. The same could be said in the late 1980s for the "war on drugs" period. Perhaps increased environmental concerns will usher in such a period soon for water quality, and agriculture's role in it.

Campaigns also appear more effective when they provide

information about topics people already generally agree on. Many campaigns deal with issues already having a high degree of public consensus, e.g. mental health (Douglas at al., 1970), alcohol and drug abuse (Feild et al. 1983), and child abuse. At least part of any success of such campaigns may be based upon building off a public consensus of agreement and providing additional information or argumentation to develop or intensify specific kinds of attitudes or behaviors. Campaigns attempting to generate social change on more controversial or ambiguous issues may meet with less success, e.g. United Nations support in the late 1940s (Star and Hughes, 1950), seat belt use in the 1970s (Robertson et al., 1976), and birth control (Udry, 1974). However, positive influences from campaigns are possible on some resistant practices related to public health, such as cigarette smoking (Warner, 1977; Flay, 1986).

Other approaches to the targeting of audiences are more based on cognitive-motivational dispositions. For example, previous work by Grunig and Hunt (1984) suggests for the purposes here a fourfold typology of types of publics. The most open to communication and the most likely to behave in accord with the public information objectives is the "Know and Care" public, the group that understands the issue and is predisposed to do something about it. They are knowledgeable about water quality and related BMPs, and care enough to be concerned about it. Communication to them might be more based upon motivating them to take action in ways appropriate to their circumstances.

Setting more cognitive outcomes is almost a given for the second public, the "Don't Know But Care" public. This public must have a reason to activate its "caring" and that most likely will require increased subject matter awareness, knowledge gain, comprehension, and heightened salience prior to attempting behavioral change objectives. In one sense, this may be the easiest public to reach because the desired outcomes are message-based cognitive ones. Those who indicate specific needs for BMP information fall into this category.

The "Know But Don't Care" public offers a distinct challenge in designing communication strategy since their position is far from fixed. It may be possible to achieve a range of attitudinal and behavioral level outcomes with this group if message and channel strategy are designed to spark interest, involvement, and support. Strategy should be planned to prompt information seeking rather than allowing for continued passive processing.

Finally, the "Don't Know and Don't Care" public is the most difficult to reach. At best, the public information professional could expect to achieve an awareness outcome with such a group. Even so, the costs incurred to achieve awareness may not be worth the effort particularly if this group's awareness is of little consequence to the organization or the issue in question.

While these typologies are analytically easy to distinguish with adequate formative audience data, they have yet to be blended into the more complete adoption process model, or tested in terms of viability in various field communication settings. Grunig et al. (1988) offer a more analytical view of "situational" publics as applied to a sample of Maryland farmers. They distinguish among groups who are either: (a) active on all relevant issues; (b) active only on a single "hot" issue, e.g. well contamination; (c) active on a single "personal" issue, e.g. animal research and rights; and (d) apathetic on virtually all issues. Findings indicate that information seeking varies considerably according to these issue concerns. Grunig et al. also advocate more concern in adoption-diffusion research with initial attitudes and information needs of farmers with respect to a practice.

It also should be noted that producer adoption of water quality BMPs often requires significantly more complex input and effort, as well as cost, than many of the issues dealt with in the campaigns researched previously. Anti-drunk driving campaigns have a rather simple message and behavior to get across: "Don't drink and drive" pretty much says it all. That is not to say that accomplishing behavioral change here is at all an effortless task, but that it is simpler than many of the BMP production changes being called for, where the proposed solutions are comparatively quite extensive, complex and detailed.

Communication Campaigns and Demonstration Programs

Many previously evaluated campaigns make a strong plea for the integration of more interpersonal or "hands-on" programs with more general media efforts. In the case of the USDA projects, it is actually the hands-on demonstration farm efforts driving the supplemental media programs, but the overall benefits should be similar. The demonstrations should not only prompt social interaction and reinforcement, but also build the kinds of self-confidence that lead to control over one's environment, thereby setting the stage for learning and practicing new behaviors.

Heinzelmann (1988), writing of more urbanized neighborhood groups, indicates that citizen involvement in communication campaigns is more likely to occur if done in the context of an existing community network or organizations of citizens with a history of joint decision-making. Moreover, grassroots groups induce a sense of ownership or a stake in the task, thereby sustaining interest and participation over a longer time period.

Apart from that noted in the more comprehensive review of demonstration farms in Section 2, there has been little formative or summative evaluation of the impact of demonstrations. Related "field clinics" or workshops in areas such areas as diverse as

public health (Flora et al., 1990) and crime prevention (Rosenbaum, 1986) have met with some quantifiable success, however. A key ingredient appears to be transferring to participants, apart from hands-on knowledge, a belief in the value of the practice to them and a sense of competence that they can successfully implement -- as well as evaluate -- it.

Key Research Questions

Given the issues raised in this section, this evaluation project poses several research questions specific of communication processes among producers. Most of these can be regarded as baseline or formative research questions, deemed critical for subsequent analyses, and equally important, to assist USDA project planners in the ongoing design of the demonstration projects and their allied information and education efforts:

1. To which sources and channels are farmers exposed? To which do they attend? Which do they seek out for specific kinds of information? Which do they find most useful for specific kinds of information?

2. How does the use of mediated channels differ from the use of interpersonal ones?

3. How do individual types of farmers differ in their informational needs?

4. How does farm size, income, and other demographic characteristics influence the use of information sources and channels?

5. What factors influence the utility of sources and channels?

6. How does use of information sources and channels differ according to the stages of the adoption process?

Additional questions more pertinent to the adoption process per se are noted in Part A of this section.

SECTION 3: THE CONTEXT OF THE USDA DEMONSTRATION PROJECTS

A. STATE OBJECTIVES AND PROCEDURES

A brief description of each 1990 demonstration project is provided to obtain a sense of the diversity addressed in this Producer Adoption Study. Each description provides a brief statement of the problem, and then a synopsis of the demonstration objectives and procedures. Some of this information, developed from the original project proposals and plans of work, may have been modified over the last two years. However, it still provides a good sense of the demonstration projects examined by the Producer Adoption Study.

1. California

The Sacramento Valley contains 90% of California's rice lands, which drain into the Sacramento River system. For this reason, the California Demonstration Project was the only location where a suitable comparison site could not be located. In the demonstration area, one-half of the total rice land rests on poorly drained clay soil that becomes waterlogged and anaerobic with winter rainfall or summer irrigation. The predominant rice irrigation method in California is continuous flooding of sowing in the spring for approximately 120 days until the fields are drained for harvest.

There have been pesticide detects in the groundwater and fish kills indicating movement off-site. A bitter taste in the municipal drinking water of the city of Sacramento was traced to a rice herbicide metabolite in 1981.

Demonstration Objectives

1. To provide an information base of various types of water management systems currently used in rice production.

2. To prepare a state-of-the art rice water management publication emphasizing strategies for converting to self-contained irrigation systems.

3. To establish and evaluate prototype static water or tail water return systems for use in demonstration and education of economical and effective irrigation of rice.

4. To identify the characteristics of soils leading to groundwater pollution in California rice soils, to provide mapping of their locations and recommendations to ameliorate chemical movement into groundwater.

5. To provide research sites within the demonstration project to further evaluate:
   a. the fate of rice pesticides
   b. the efficiency of water management
   c. changes in the chemical and physical environment
   d. effects on the rice cropping system
   e. other factors that become pertinent to the successful adoption of permanent self-contained water systems.

Demonstration Procedures

1. Implementing a combined program to encourage rice grower adoption of management strategies which reduce herbicide pollution in surface and groundwater of the Sacramento Valley, California.

2. Identifying and demonstrating to growers key self-contained irrigation systems, monitor their attributes with respect to their compatibility and cost effectiveness in rice production and water containment, and to encourage their adoption through demonstration of appropriate management practices.

3. To provide technical advice and cost sharing for installing self-contained irrigation systems.

4. To provide ongoing technical advice and cost sharing program encouraging the installation of self contained water systems. To evaluate self-contained water systems for compatibility with rice production.

5. To provide an economic evaluation comparing the installation and operational costs of self-contained and conventional systems.

6. To provide an ongoing education program to encourage the adoption of technology developed from the project.

2. Florida

The Lake Manatee Watershed encompasses approximately 81,000 acres along Florida's west central Gulf Coast. The Manatee Lake Reservoir serves as the municipal water source for the city of Bradenton and several smaller communities totaling 275,000 residents. There is increasing urban pressure to protect the quality of this water source.

The upper reaches of the watershed lie in the state's phosphate mining region. As a result the lake has been

identified as nitrate, rather than phosphate, limited with respect to its increasingly common blooms of blue-green algae.

Demonstration Objectives

1. To measure loadings of nitrogen and phosphorus to Lake Manatee and the order-of magnitude pesticide levels. (possibly in sub-watershed basis)

2. To assist growers in adopting water and fertilizer management technologies that will reduce the amount of fertilizer nutrients (emphasis on nitrogen).

3. To assist growers in utilizing state-of-the art, often computer-based on-farm decision making packages to best manage their fertilizer and pesticide inputs for minimization of groundwater and lake water contamination.

4. To survey producers in the watershed to determine base-level fertilizer and pest-control practices in order to gauge Best management Practice adoption. To survey producers following project completion to establish the degree of adoption and success of various management practices designed to reduce groundwater contamination risks.

Demonstration Procedures

1. The project will primarily emphasize BMP demonstration on citrus and vegetable operations in the watershed, along with lesser emphasis on improved pasture, grazing lands and a small suburban housing development located within.
   a. mechanism for monitoring the impact of existing practices
   b. direct technical assistance to landowners in planning chemical application
   c. informational and educational activities for growers, policy makers and concerned citizenry of the area
   d. cost-share incentives for participation in the demonstration

2. In providing state-of-the art water, nutrient and pesticide management information for grower consideration, each grower will have access to the management information via computer state-wide network, soil sampling and analysis, irrigation scheduling, nutrient and pest management, including computer modeling to assist in rates and timing.

3. Base-line and post study watershed assessment which includes the collection of farm-budget information, management for various land use settings, and water quality improvements.

3. Maryland

The Monocacy River watershed is a sub-basin of the middle Potomac River Basin located in Frederick, Carroll and Montgomery counties. Groundwater resources in the Monocacy river watershed are and have the potential to be impacted by nitrogen and agrichemicals due to the nature or agricultural activities and the geology of the area.

Nonpoint sources of pollution tend to be the major contributors of nutrients, bacteria and suspended sediments to ground and surface waters. The predominant sources of nutrients are agricultural operations and animal wastes.

Demonstration Objectives

1. To develop and implement effective nutrient management plans.

2. To demonstrate the use of cover crops for nutrient management.

3. To plan and apply erosion and sediment control systems.

4. To implement an Integrated Pest Management (IPM) program.

5. To demonstrate safe handling of agrichemicals including adoption of proper storage, mixing, application, clean-up and disposal.

6. To establish cost-sharing and incentive payment program for those who cannot afford nutrient and pest management systems.

7. To demonstration the need for wellhead protection which includes: information on the maintenance of wells, on-site waste water disposal stems and the health effects of contaminated water.

8. Develop an interagency team for contacting and working with farmers to coordinate effort so farmers are not "pestered to death".

Demonstration Procedures

1. To develop nutrient management plans for organic wastes, chemical fertilizers, soil reserves, and crop residues. It also includes soil and manure testing, manure calibrating and incorporation.

2. To establish a database on current types, rates and dates of nutrient applications.

3. Implement and monitor conservation practices for nutrient retention and reduction, including a bioengineering approach to design and creation of wetland areas, living filter strips, riparian zones and low input sustainable agriculture.

4. Demonstrate tillage systems which will allow incorporation of manures and still provide the erosion protection equivalent to no-till. This also includes other practices such as ridge-till, strip-till or modified tillage systems, and no-till crop rotation systems.

5. Conduct an education campaign to promote the most feasible and cost effective practices.

6. Contact farmers that do not have a Soil Conservation and Water Quality Plan (SCWQP) and develop plans where appropriate. Coordinate this plans with CES.

7. Promote the following practices for erosion and sediment control, strip cropping, grassed waterway, conservation tillage, diversion, waste management system, and streambank protection.

8. Conduct education programs on IPM strategies for growers and agribusinesses in the sub-basins. Emphasis will be on accurate pest identification and biology.

9. Help growers establish a framework for hiring and managing field scouts. To increase IPM scouts continuity, a scout subsidy geared to the number of acres scouted will be initiated.

10. Survey growers in the first and last years of the project to evaluate the pest, pesticide, and cropping practices of both program participants and non-participants.

11. Develop and implement standards and specifications, for practices that impede accidental farm chemical loss. These include back-siphoning.

12. Establish a data base on the current methods of handling agrichemicals. Personal interviews will be conducted with a selected portion of the farm operators to assure consistent data.

13. Education materials and demonstrations will be used to stress the proper use and handling of pesticides, pesticide application equipment and the on and off-site water quality benefits associated with safe handling of agrichemicals.

14. Develop an incentive system for IPM crop production guarantee, nutrient management incentive to show BMPs can be cost-effective, pasture management/riparian zone protection (stream access), wetland establishment for nutrient/pesticide management (wetlands created to intercept and treat pollutants is warranted).

15. Identify locations of wells, septic systems, cisterns, sinkhole and groundwater recharge areas.

16. Implement an education program in the sub-basins concerning proper construction and maintenance of wells and septic systems.

17. Implement a water testing program to sample wells in the sub-basins and provide information on alternatives for water treatment if wells are found to be contaminated. Testing will be primarily for nitrates and fecal coliform bacteria, with some pesticide analysis.

4. Minnesota

The Anoka Sand Plain extends through eleven counties of east central and central Minnesota and consists of sandy soils typically low in organic matter and clay content over shallow, surficial aquifers. The intensity of livestock production is relatively low. Crop production is the firm base for both irrigated and dry land agriculture. The major crops are field corn, soybeans, potatoes and sweet corn.

In recent years there has been a rapid expansion of residential development into the Sand Plains. This development magnifies the concerns that revolve around the quality of the groundwater. In addition the Anoka Sand Plain is a groundwater recharge area as well as a source of recharge for the Mississippi River which supplies water for the Twin Cities.

The Anoka Sand Plain experiences high levels of nitrate-nitrogen in the groundwater. Thirty of 99 wells sampled have been found to have concentrations in excess of 10 ppm.

Demonstration Objectives

1. To assist growers in adopting nitrogen management practices that will reduce the amount of nitrogen fertilizer used in crop production.

2. To increase farmer use of more efficient irrigation management practices.

3. To develop and test an integrated Best Management Practice approach to select pest control practices point and non-point source issues will be addressed.

4. To gain on-farm adoption and experience with current state of the art Best Management Practices to protect water quality.

5. Adoption by cooperators of best management practices for handling and application of pesticides to prevent point source groundwater contamination including: pesticide transportation, storage, mixing, loading, responding to spills, prevention of back-siphoning, equipment maintenance, calibration and cleaning, application techniques, off site movement and pesticide waste and container storage and disposal.

Demonstration Procedures

1. BMPC's (Best Management Practice Consultants) will work one-on-one with participating growers to develop nitrogen management practices for "specific crops" involved in the project.

2. The BMPC's will also work with irrigation scheduling for field corn, sweet corn, and potatoes.

3. To collect base-line and project completion data on fertilizer and pest control practices. This will be on a eleven county area.

4. Establish a computerized pest management system that will integrate pest control decision with water quality concerns for the Anoka Sand Plains area. (Combines WEEDIR, INSREC, SSIS and a pesticide data base being developed by Minnesota Extension/SCS)

5. Nebraska

Certain areas of the central Platte Valley have high concentration of nitrate in groundwater due to the use of high

rates of nitrogen fertilizer and excessive irrigation water for corn. Generally, groundwater which is most effected by elevated nitrate concentration is shallow and underlies coarse-textured alluvial soils which are primarily under irrigated corn cultivation.

Groundwater underneath the finer textured upland soils has shown trends towards increasing nitrate levels in some parts of Nebraska. Recent surveys of irrigation domestic and municipal wells in Nebraska show an increasing number of wells testing greater than 10ppm in nitrates.

With continued deep percolation of excess irrigation water, movement of nitrate presently in the intermediate vadose zone into the aquifer can be expected, increasing nitrate concentration in groundwater.

Demonstration Objectives

1. To foster adoption of nutrient and pesticide management practices that reduce chemical loading.

2. To promote producer adoption of irrigation management practices that provide adequate moisture to growing crops while impeding leaching of agrichemicals to groundwater.

3. To demonstrate that producers can achieve suitable economic returns while utilizing agricultural chemical and irrigation management practices.

4. To encourage adoption of agrichemical and irrigation management practices that will ensure the preservation of groundwater quality.

5. To demonstrate management of nutrient resources using animal waste and commercial fertilizer.

6. To conduct a pre-implementation/post-implementation assessment.

Demonstration Procedures

1. To develop and manage 20 to 30 demonstration sites based on existing or potential for nitrate and or pesticide contamination of the primary aquifer. These demonstrations will provide information and assistance on the following practices and procedures: deep soil sampling, testing irrigation water for nitrates, selecting realistic yield goals, using irrigation water flow meter to judge application rates, using irrigation

surge valves, IPM, delaying application of nitrogen fertilizer to increase availability, using nitrification inhibitors, nutrient crediting for legumes and manure, minimizing irrigation water runoff, pesticide mixing and application, capping/plugging abandoned wells, eliminating on-farm waste fills, pesticide containers, etc.

6. North Carolina

Herrings Marsh Run is located in northwestern Duplin County. This area contains medium to coarse textured soils that have seasonally high water tables. A high potential exists for impacting surface and groundwater as well as adjoining estuarine and environmentally sensitive recreational waters.

Duplin County has the highest agricultural revenue of any county in North Carolina ($268 million). Approximately 77% comes from the poultry and swine industry.

The overall project goal is to protect the water quality in the total Cape Fear Basin of which Herrings Marsh Run is a part.

Demonstration Objectives

1. To demonstrate accelerated voluntary adoption of crop and animal production practices that reduce impacts on surface and groundwater by increased technical and educational assistance.

2. Reduce commercial fertilizer purchases by 30% with more efficient animal waste recycling to cropland.

3. Centralized dead animal disposal sites to handle turkeys and hogs.

4. Well testing for nitrates, chlorides and conductivity to determine potential pollution from over-fertilization, improper animal waste management or poorly functioning septic tanks.

5. Protection of drinking water through waste water management.

6. To reduce pesticide loading to surface waters.

7. To reduce swine production inputs to surface waters.

8. To reduce poultry production inputs to surface waters.

9. Increase participation in the Integrated Pest management

Program.

Demonstration Procedures

1. Conduct an extensive public contract and educational program to positively influence attitudes.

2. Analyze knowledge, attitudes and behaviors by telephone interviews.

3. Beef producers will be educated and assisted to properly implement systems or procedures for intensively managed pastures for waste utilization and livestock production, to utilize the feed value of poultry litter, to reduce chemical use and eliminate animal access to streams.

4. Demonstrate and evaluate intensively managed pastures for waste utilization and livestock production.

5. Cost sharing will be provided for grassed waterways, field borders, filter strips, critical area stabilization, conservation tillage, pipe inlets, terraces, diversions, nutrient and waste analysis, nutrient management, waste application, grassed rotations, cropland conversion and farm pond (sediment traps) and lagoon enlargement.

7. Texas

The Seco Creek Watershed comprises an area of 267 square miles in Bandera, Frio, Medina and Uvalde Counties in South Central Texas (50 miles west-northwest of San Antonio). In many places, streams of surface water enter the aquifer directly through open caves. Seco Creek is a source of recharge to the Edwards Aquifer (supplies water for 2 million people) and is similar to other streams that cross the recharge zone. There is no filtration or purification effect of water moving through the soil material.

The Seco Creek Watershed is comprised predominantly of rangeland. The water quality problems in Seco Creek relate to sediment and associated nutrients and pesticides. Efforts to increase flow (runoff) may potentially cause elevated sediment or nutrient content in recharge water.

Demonstration Objectives

1. To reduce the impacts of nonpoint source water pollution from agricultural chemicals, animal wastes and sediment.

2. To effectively suppress erosion and reduce sedimentation.

3. To demonstrate the potential economic, social, and environmental impacts of various resource management systems.

4. To demonstrate the agricultural community's willingness to address problems of water quality.

5. Integrate brush and grazing management systems, that are necessary for water quality management, wildlife habitat improvement, and erosion control on sustainable agricultural production units.

6. Use of cropland management systems to improve water use efficiency (i.e, irrigation).

7. Soil testing to determine recommendations for proper nutrient application rates, types of fertilizers, methods of application, fertilizer timing and splitting of applications.

8. Integrated Pest Management which includes: alternative application methods, rates, placement, and timing and proper disposal of waste chemicals and containers.

9. Utilization of crops and crop rotations to reduce both agricultural chemical use and pest damage.

10. Use of climatological data to manage crops.

11. Tradeoffs between surface runoff and infiltration rates and water quality and water quantity that enters both surface and ground water systems as a result of alternative land management practices.

12. Improvement in water well design or closure.

13. Proper handling and disposal of rural household sewage, solid waste including chemicals and containers, and animal wastes including runoff.

Demonstrations Procedures

1. To demonstrate alternative agricultural production systems and management practices designed to minimize runoff and leaching.

2. To demonstrate alternative management practices and policies that contribute to sustainable agricultural production.

3. To demonstrate that available best management practices and integrated production systems are profitable and improve water quality benefits.

4. To demonstrate the acceptability of cost-effective best management practices and production systems that prevent nonpoint source pollution of streams and groundwater by reducing runoff containing sediment, agricultural chemicals and livestock wastes.

5. To demonstrate potential sources of water quality contaminants including septic tanks, concentrated animal facilities, pesticide containers and improperly constructed or abandoned water wells can be corrected.

6. To demonstrate that producers and business will address water quality issues.

7. To demonstrate rangeland management for improving vegetative cover by reducing infestations of competitive, non-productive, invader woody plant species and by proper grazing management.

8. To demonstrate alternative management practices for cropland including conservation tillage, fertilization practices, water conservation practices for precipitation and irrigation water applications and integrated pest management.

8. Wisconsin

Ground and surface water problems have been identified within the East River Watershed, a 215 square mile, rural-urban area, located in two counties of northeastern Wisconsin, south of Green Bay. Nutrients, pesticides and other toxic materials from agriculture contribute to this contamination.

Karst features are present in the watershed. Many municipal wells utilize the aquifers (draw-down in DePere is 250, encompassing all of Brown County).

Approximately 24% of the northeast portion of the watershed lies within metropolitan Green Bay. The most intensively farmed area of the county lies within the watershed. Sixty percent of the watershed is cropland. Four hundred of the watershed's 550 farms are dairy operations totaling nearly 42,000 animal units.

Recent findings indicate that inadequate crediting or lack of crediting livestock waste for nutrients has caused excessively high nitrogen and/or phosphorus levels on cropland. Reducing phosphorus loads to Green Bay through increased use of BMPs for

nonpoint source pollution control may reduce the need for 150 million dollar improvements to the Green Bay Metropolitan Sewage Plant.

Demonstration Objectives

1. To reduce nutrient and pesticide pollution of groundwater and surface water through improved cropland, pasture, streambank and wetland management.

2. To reduce pollution potential from ag chemicals, livestock waste, human sewage and hazardous waste through improved design of farmstead structures.

3. Improving landowners knowledge of drinking water quality.

Demonstration Procedures

Potential specific demonstrations may include:

- Nutrient management for corn production
- Management of nutrients form livestock waste and other organic wastes
- Nutrient management for forage production
- Reduce herbicide use through crop rotations
- Rotary hoe and cultivation systems
- Herbicide selection and method and timing of herbicide applications
- Reduce rootworm insecticide use through crop rotations
- Conservation tillage forage establishment
- Pasture management to reduce water pollution and enhance profitability
- Stream corridor filter strips
- Wetland restoration
- Pesticide mixing and loading area demonstrations
- Pesticide storage area design; location and management
- Retrofitting field sprayers to improve calibration
- Reduce back siphoning and reduce overflow risk
- Barnyards and livestock holding area design
- Milkhouse waste handling
- Petroleum storage and handling systems
- Farm hazardous waste collection
- Sealing abandoned wells
- Improving well design and location
- Improving use of existing septic systems
- Replacement of failing systems
- Drinking water education
- Use of farm assessment system questionnaire to identify potential groundwater pollution sources

B. BASELINE COMMUNICATION EFFORTS IN THE DEMONSTRATION SITES

This portion of the University of Wisconsin report outlines the organizational structure, dynamics of interagency cooperation and communication, and information and education (I & E) components of the eight water quality demonstration projects located in California, Florida, Maryland, Minnesota, Nebraska, North Carolina, Texas and Wisconsin. The purpose is to provide a context for the UW research evaluation by describing the projects' I & E strategies to increase awareness about water quality protection and to inform their respective audiences about water quality best management practices (BMPs).

Over a five-year period (1990-95), the projects' I & E strategies will be tracked through site visits, long-distance telephone interviews, questionnaires and document collection. The body of this report summarizes findings from surveys and interviews conducted during 1990 - summer 1992. Interviews were conducted with state and local project personnel, including communication professionals, for each of the eight projects. Questions of interest included: (1) interagency cooperation between ASCS, ES and SCS; (2) selection of cooperators and planning of demonstrations; (3) planning of I & E efforts; (4) USDA and state prioritization of I & E efforts supporting the demonstrations; and (5) use of controlled and public media for I & E efforts.

Each project's organizational structure will necessarily influence the way these demonstration projects are planned and implemented. The political bent and agendas of the three key agencies, their past working relationships and current leadership are all factors that will influence the direction and outcomes of these projects. To initially investigate the dynamics at work in each, a team of researchers (the Nebraska Assessment Team) visited each state and interviewed management and local personnel to assess the management structure, professional compatibility, and communication and work environments of the demonstration projects. All of the assessments were performed during the projects' first year, with both formal and informal observational and anecdotal reports filed describing the outcomes of each visit. Some of the insights of the Nebraska Assessment Team Study have been useful in fleshing out the management picture described here. (Rockwell, Hay and Buck, 1991). Given its influence on project outcomes, project organization is a dynamic that will be accounted for in this and future analyses of demonstration I & E campaigns.

Another focus of this analysis is the I & E strategies project personnel intend to use (or are using) to educate their audiences about BMPs, along with the demonstration activities.

Several questions are addressed here. For instance, how familiar are communication practitioners with their audience(s)? Is their audience aware or concerned that water quality has been identified as a problem in their area? What factors appear to stimulate awareness of water quality issues in the project area? Do practitioners know what media or information sources their audiences rely upon? How much priority do leaders put on planning and implementing a comprehensive I & E effort supporting the demonstration project?

Communication, although essential to achieving internal cohesion and external goals, difficult to harness and manage. Many people rely on their intuition in communication, in both personal and professional realms. However, its successful utilization as a tool is often bred of intent and purpose. Therefore one focus of the interviews with project leaders was on the degree to which their I & E strategies are purposeful and planned. The differences between the various projects in terms of communication strategies are detailed later in this report.

1. Information Gathering

This study is based upon information provided through telephone interviews and site visits with project leaders and communication practitioners. Information provided via newsletters and other documents is also incorporated into this report.

The first step in gathering information was identification of key people in each project. To this end, state-level project leaders were called, the information-gathering effort was explained, and the names of key communication people (those involved in constructing and carrying out the I & E effort) were requested.

From January-July 1991 identified project personnel were telephoned. These people ranked from the state to local level, and they were interviewed at length about their responsibilities, the selection and scheduling of demonstrations, I & E strategies, and the information environment permeating project boundaries. Most interviews were conducted long-distance, and ranged in length from 15 minutes to one and one/half hours. In three instances, site visits were made to the Wisconsin, Nebraska and Maryland projects to interview project personnel in day-long sessions. These site visits help us to learn more about the projects and provided a clearer picture of the agricultural territory and type of farmer these projects are targeting.

In addition to interviews, media and strategy surveys were distributed (See Appendix B.1) to communications practitioners. These were compiled from a variety of media source books. Media lists ranged over print, television, radio and cable outlets. In effect, these media surveys yield a "media map" of the

demonstration/comparison areas. In addition, communications practitioners were requested to specify which type of communication strategies/outlets they intend to use most intensively in their projects -- whether controlled (e.g., brochures, fact sheets, etc.) or mediated.

Finally, after completing the initial interviews, project personnel were re-contacted periodically for updating about the projects and to learn more about demonstration tour/field day schedules and publicity strategies. These follow-up calls will continue to be made on an ongoing basis.

2. Observations: Project Organization/Interagency Relationships

Project Organization -- Internal Linkages

According to Chuck Ullery, then National Program Leader for Water Quality (USDA-ES), project leaders were provided an outline of USDA-recommended objectives for the demonstration effort, but were not advised about <u>how</u> to actually accomplish objectives. Direction from the USDA, then, was non-specific with regard to how projects were to be implemented. USDA direction <u>was</u> specific to the extent that the ASCS, SCS and ES must work together to achieve goals and allocate funds. (Not surprisingly, budget allocations among ES, SCS and ASCS have heavily influenced the organization of the projects and designation of personnel.) It has been up to the state level project leaders, then (two co-leaders, designated within SCS and ES) to set the agendas and goals of the projects with project managers and local personnel.

Some have suggested that the direction from USDA has come across occasionally as vague and untimely. Different interpretations of directives from the three USDA agencies (at the Federal level) received at different times among state agency personnel have caused confusion at the state and local level, where practical cost-share allocations and decisions are made. Complaints expressed to the Nebraska Assessment Team focused on the short turnaround time the USDA allowed for submission of demo project proposals. (Rockwell, Hay and Buck, 1991). The birth of some of the early organizational confusion and tension on some of the projects may be traced to a possibly hasty proposal process. One interview also complained that the USDA often waffles on making up their collective minds and then, upon making a decision, wants it "done yesterday." Others at the local level have complained that project agendas have been disrupted to respond to Federal requests and changes.

Project Leadership

Within each project, it is not unusual to find that the attitudes, agendas and organizational style of the upper echelon

influence what occurs among the lower ranks. Positive comments about project leaders seem to center on the following:

* the leader's ability to interact cordially and effectively with all project team members;

* the leader's ability to organize committee meetings and maintain agendas and timelines;

* the leader's ability to assure good, ongoing interagency communication among all project team members; and

* the leader's ability to keep in mind -- and to keep the project team on track -- the pursuits and vision of the project.

It seems pertinent to point out here that the communication and organizational style of the responsible project manager (generally the person delegated by the top ES and SCS leaders to actually coordinate administration of the locally-run projects) appears to have a significant impact on the tone of the projects and their organizational momentum. Other factors of course enter into the picture (such as history of interagency relationships, personnel roles and recognition/appreciation of personnel efforts); however, project leadership is an important dynamic to recognize when looking at the way these projects are structured, how they are run and the attitudes of the personnel involved.

Interagency Communication

It was pointed out by more than one person that each agency has its own agenda and personality. In interviews it appeared that the following perspective prevailed about the roles of the three involved agencies: ASCS is interested in allocating funds for cost-share, and doing so by the book. SCS is interested in assuring that producers implement practices according to federal specifications, in order to qualify for available cost-share dollars. Extension is interested in educating producers about the spectrum of options available to them, and then letting them decide what to use and how to use it. The different organizational <u>and</u> budget strategies of the agencies necessarily influence their world views, allocation of resources, approaches to working with farmers, and means of resolving problems and interagency conflicts.

In order to cope with the disparities among these agencies (and other organizations that may be associated with the projects), project managers have in some cases set up committee structures with regularly scheduled meetings, to facilitate interagency communication and teamwork. Interagency steering committees, technical committees and communication committees have been implemented in several states. Routine, informal get-

togethers of project personnel, communication by electronic mail and day-to-day phone contact have also become routine. In cases where it is apparent that policy-makers and involved agencies (especially ASCS) are unclear about project goals and activities (many people initially perceived these demonstration projects to be set up for research rather than educational purposes), some projects set up interagency newsletters to educate agency and policy people. (See, for example, Monocacy Update, Appendix B.2) Other projects include agency personnel on mailing lists for newsletters that are directed at producers, consultants and ag business people.

In a nutshell, those states that had strong interagency ties prior to this project (e.g., Texas) have had an easier time getting organized and moving forward. Interestingly, the structure of the project in Texas is fairly informal. Interagency communication is not committee-driven, but appears to be driven by ongoing communication, daily phone and FAX contact. Part of this may be due to the fact that Texas project personnel are dispersed geographically. The lack of formality may also be due, however, to the fact that interagency communication was fairly strong prior to inception of the Seco Creek demo project.

In most other states, where interagency relationships were not as strong prior to project inception, formal structures were set up to facilitate communication. There appears to be one exception to this finding. It is difficult to determine if the lack of committee structures in this one state have inhibited interagency communication. It is very possible that the involved personnel interact at so many other committee meetings in their daily routine that establishing separate committees to oversee the activities of this additional project is unnecessary.

Teamwork Among Agencies

In general, the eight states fall along a spectrum of cohesion in terms of teamwork and interagency communication/cooperation. A number of factors may have influenced the initial and ongoing development of a teamwork mentality on these projects, including

- a longterm history of political problems or misunderstandings prior to project inception;
- staff vacancies or changes in key positions;
- communication gaps between different government levels (local to state, state to Federal) may inhibit clear communication and problem resolution; and
- lack of interagency communication or communication/ committee structures.

All of these variables (and others) must be taken into consideration when attempting to evaluate the level of teamwork these projects enjoy.

Office Organization

In Wisconsin, Maryland and Texas demonstration offices have been set up separate from ES and SCS offices. The other states have set up the projects primarily through the county ES offices, with county ES agents and SCS conservationists coordinating efforts out of their respective offices.

One person observed that the separate office situation posed a challenge because in addition to having to get the project up and running, it was necessary to establish credibility of a new and unknown organization/project. This person commented that it may have been easier to coordinate the project through the local Extension office, which already had a credible reputation.

On the other hand, another interviewee offered the opinion that establishing a separate office for their project seemed to better assure that the project was not associated solely with either the state SCS or ES. The outcome in this case appeared to be political as well as "mental." No one agency takes credit for demonstration or I & E efforts, and the presentation of a unified front (and specific project identity) to the public is a public relations bonus.

In defense of the states that have not chosen to organize their projects through a separate office, such a venture requires significant cash outlays and expenditures of personnel and organizational resources. Some states simply cannot afford such outlays in light of varying demonstration needs and I & E costs.

Roles and Responsibilities

As mentioned earlier, each project has at least one person designated as project manager. (In Nebraska and Texas the honor is <u>equally</u> shared by ES and SCS personnel.) These project managers act as liaisons and facilitators between the state-level project directors, state-level communications specialists in ES and SCS, and local extension agents and district conservationists.

In the communications arena, all the states have had ES and/or SCS communications professionals (at the state level) contributing efforts to some project I & E activities. Other state and local agencies have also contributed to, or assisted with, I & E efforts -- as various state and local project agendas coincide.

Recently, the communication professional in the south

central district of Nebraska resigned (early Summer 1992) and has not been replaced, and ES communications professional in North Carolina, moved to another position. The North Carolina project manager oversees this area in the interim hiring phase.

Although situations and plans of work for all ES and SCS communications professionals differ widely across states, the state level communications personnel generally offer assistance to local agents in the following ways:

* composition of news releases and articles,
* interactions with the press (generation of press kits),
* organization of major tours with agency leaders and the media, and
* composition of slide shows, video tapes and PSAs

State-level communications people, both in ES and SCS, also help disseminate project information to public media and trade press on a regional or statewide basis. Although some SCS public affairs officers support the projects in some capacity in these efforts, primary responsibility for I & E appears to fall in Extension's domain.

Local agents, especially in the ES, have responsibility for organizing tours, field days, meetings, writing articles for the local press and regular dissemination of press releases related to project events/activities. As one communications specialist put it, "Local extension agents are also expected to be communicators."

In virtually all states, many communications responsibilities are included in the daily work routine of Extension agents and SCS conservationists, who are often already at capacity in their workloads. (Personnel in the three states with separate project offices have a workload of similar diversity.) Responsibility of local agents run the gamut from attending ongoing meetings; finding cooperators, funding and planning demonstrations; monitoring physical outcomes of demonstrations; interacting one-on-one with the public and cooperators; and fulfilling all state and federal reporting requirements -- to mention only a few of their responsibilities. They also have to make time in their schedules to interact with the University of Wisconsin research team as the need arises. Interrupted and varied work schedules thus are the norm. In addition, the agents perform ongoing I & E tasks -- writing articles and news releases, providing interviews to journalists, putting together public meetings and going on radio shows, as these opportunities arise. In sum, on every project, local agents and project personnel have significant responsibility for carrying out project information dissemination/I & E activities in addition to fulfilling numerous other responsibilities. The

varied (and full) nature of the agents' plans of work reflects the above diversity of job demands.

After two years of hammering out project objectives and roles, the projects are clear on who is responsible for what; and people are, for the most part, settled into their roles (except in cases of turnover in significant positions, e.g., California SCS, Nebraska's communication specialist vacancy, and, more recently, the hiring of new project personnel in Minnesota).

Follow-Through on Responsibilities

On some projects, tension has resulted in cases where follow-through on responsibilities has been low or inconsistent. To protect information source confidentiality, specific identities of states and people concerned about such interagency tension will not be divulged in this report. Notes have been made about specific tension-generating situations, and observations made to the fact that some of these (if not all of them) may be resolved over time. For the time being only the following will be noted:

* In one state, SCS apparently made commitments to certain I & E aspects of the project and then apparently did not keep them. Furthermore, frustration was also expressed by personnel in the same state about SCS getting equal billing on project events, but not necessarily contributing equal effort. Some confrontation about these issues has occurred but is now muted. (This situation was revealed in 1991 and 1992 interviews.)

* In a few states it was mentioned that some territorial turf carving was occurring during the initial stages of their projects; however, this situation seems to have come under control over time in the states where it was mentioned. Now people appear to be working more comfortably, as their roles have become more clearly defined.

Other projects may have experienced similar problems balancing responsibilities between SCS and ES. However, it is unlikely that all of the tension-generating situations will be revealed to the University of Wisconsin research team.[1]

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[1] Furthermore, it is highly likely that the UW research effort itself is an ongoing source of interruption and hence frustration for some project personnel; however, most of the people interviewed for this particular report were very cordial and

A point that was brought up frequently in 1991 interviews across all states was that the awkward and hasty proposal process which launched these projects abbreviated the level of ownership some agencies initially assumed for them. However, project evolution and improvements in interagency communication appear to have helped iron out some of these start-up problems.

Other factors that have contributed to follow-through problems obviously include position vacancies, budget cuts, and differing budgeting strategies in ES and SCS. This list is not exhaustive; however, it provides a flavor of some of the obstacles project personnel face in carrying out their mission.

Focus of Interview Efforts

After initially contacting state level people, in-depth interviews were conducted with individuals who have primary project responsibilities. These interviews involved most project managers, communications personnel and some recommended local personnel. ES contacts outnumbered SCS contacts, primarily because ES appears to have primary responsibility for implementing most projects' I & E efforts. (The exception to this may be Texas and possibly North Carolina.) Many communications responsibilities are delegated to ES because this is their forte.

It is important to note that interview data gleaned from telephone conversations of necessity leaves some informational gaps. Telephones are not the best means of gathering <u>detailed</u> information; however, the interviews conducted and described herein do provide some valuable insight into how these projects are organized and the types of I & E strategies they pursue. Thus, the interviews help to develop a good general overview of the projects. For more detailed information, project and agency newsletters, and other types of correspondence, help to flesh out the picture of what is occurring in these states. Another valuable source of information about these projects (not used herein because all documents are not available at our offices at this time) is their annual reports. These reports prove invaluable in detailing project activities and demonstration outcomes -- as these are available. For detailed information about all these projects' demonstration activities, therefore, the reader is referred to the annual reports or any other newsletters and mailings the USDA may receive.

Project Organization -- External Linkages

The demonstration projects interact with a number of different "publics." The primary focal public is the producers

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helpful.

who make decisions about BMP adoption. Other potential publics include chemical dealers, consultants, the media, the agribusiness community, bankers, environmental groups, water management boards and urban residents whose opinions and involvement may impact adoption decisions.

Identification of Cooperators

During the first year of start-up activities, project managers and teams were preoccupied with the identification of "cooperators" who would be willing to demonstrate recommended BMPs. A number of approaches were taken to identify potential cooperators. These include:

* One-on-one contact between SCS and Extension agents with potential cooperators/producers;
* Nominations by local committees, comprised primarily of agency people familiar with area producers;
* Recruitment/integration of cooperators from previously operating projects (e.g., the SP-53 project); or
* Approaching farmers who wanted to apply for cost-share or who had approached ASCS, ES or SCS offices to inquire about participation.

Constraints in the selection of cooperators have included the following:

* Logistical or regulatory constraints (such as occurred in initial cooperator identification in California in 1990-91).
* Complicated and limited cost-share availability. (This was noted in both Wisconsin and Florida in interviews.)
* Annual lease arrangements that inhibit the signing of long-term agreements (LTAs). (This was especially noted in Florida in 1991 interviews.)

In looking across the eight states, it appears that the coordinators of the demonstration projects have predominantly requested producers they (or other agency people) are familiar with to become cooperators. Formal committee nomination processes, over time, have opted for less formality and more flexibility in order to speed up initial selection of cooperators.

Obviously, the projects work with numerous people and will likely expand their cooperator/demonstration base as the funds and personnel resources are available. It is important to point out that identification and selection of cooperators will be

ongoing throughout the life of the projects.

Cooperator Involvement in Setting up Demonstrations

For the most part, producers who become involved in the demonstration projects play an active role in deciding, with the SCS technician and ES agent (where appropriate), how the BMPs are to be implemented or installed. Level of producer involvement is also BMP-contingent. For example, in Nebraska a farmer will actively participate in setting up a nitrogen strip where nitrogen application levels on a particular plot of land will differ from that on the rest of his fields. However, if a farmer has volunteered to allow the project to substitute atrazine with another herbicide on a particular plot of land, the agent assigned to the farm will be primarily responsibile for herbicide application on that plot.

Installation of other, more expensive technologies (such as manure pits or re-use pits) is often contingent upon cost-share and labor availability. For BMPs that are capital and labor-intensive, active involvement of the producer in decision-making is the norm.

Consultants, Chemical Dealers and Packing Houses

Producers often rely on consultants and agricultural chemical dealers for information relevant to best management practices. Many of these people are also familiar to area agents and conservationists. Because of their influence, some projects have incorporated consultants and chemical dealers into their I & E efforts. Nebraska, a state that has a high concentration of consultants, had a meeting with area consultants the last two winters. In addition, Nebraska invites consultants contracting with cooperators to participate in local committee meetings. (Ostensibly they are invited to provide input; however, an additional goal of the project is to educate them about USDA requirements.)

The Nebraska team is proud of their innovative approach to incorporating consultants into their project and the success they have had in reaching this group. Other states do not appear to have such heavy consultant activity and have not specifically targeted consultants for I & E.

Chemical dealers may be among the agribusinesses invited to participate in some projects' committee meetings and to attend tours and field days. In Florida, chemical and fertilizer companies are considered highly useful for getting the word out about their efforts. The vegetable component of the project also actively works with area packing houses (See Appendix B.3 for descriptive letter re: packing houses), which provide a veritable network of closely-knit producers. Evidently, the

competition between packing houses is vigorous and packing houses are unwilling to share information with each other; however, a good camaraderie evidently exists between growers associated with particular packing houses. Thus, to share growers' information within packing houses are likely. By distributing the project newsletter and other information to the packing houses and working with them when possible, the ES agent working on the vegetable component of the Florida project expects to reach more growers.

The "Extended" Audience of the Demonstration Projects

In addition to targeting producers, all of the projects target other groups of people for I & E. Such groups can include local government people; environmentalists; legislators/regulators; agribusiness and chemical company representatives (as mentioned above); and media representatives, to name a few. It can be speculated that working with audiences outside the producer population itself may help to spread the word about these projects and contribute to their gathering momentum.

Although it is impossible to list all of the project efforts occurring in this area within the limited space of this report, below are some of the activities described by project personnel during telephone interviews and detailed in recent newsletter editions.

* Almost all of the projects schedule special tours and field days for federal and state agency personnel, as well as local government representatives. The tours are specifically directed at the interests of these people.

* <u>California</u> is getting national recognition for its work among rice growers, and its tour audience has included out-of-state managers of various administrative programs that are concerned with pesticide use. (Another tour for national ag leaders is planned for this Fall.) The ES project agent has also presented papers at a National Rice Working Group meeting.

* In <u>Florida</u>, an agent reported that they are inviting growers, environmental groups, water management district people, consultants and local administrators to public meetings dealing with the project and the improved management practices they are promoting. Vegetable packing houses are being targeted with information about Improved Management Practices (IMP's -- the Florida team's alternative term for BMP). Chemical companies and fertilizer companies are also foci for I & E efforts.

* Maryland has had a cooperators' luncheon/meeting, which was attended by 30-40 farmers. The group talked about last year's activities and came up with several good ideas for the project. This interaction with the farm community has occurred on a periodic basis in Maryland and has borne good fruit for the project in terms of both ideas and participation.

  Although the agribusiness community is invited to participate in tours, the Maryland project hasn't highlighted them per se on the tour agenda. The project wishes to avoid the appearance of endorsing any particular agribusiness; however, they are by no means excluded from the projects' I & E efforts.

  The Maryland team has also done a lot of door-knocking, site visits and cold calls to get better acquainted with who's who in the community, to build the project's address list, and to talk one-on-one with people in the project area.

* Minnesota has extended its network via electronic communications. The project has set up a toll free hotline for producers with questions about irrigation or educational activities. By pressing the appropriate extension, producers can access field reports, educational and tour information.

  In addition, the SCS branch of the Minnesota project solicited involvement of "Earth Team Volunteers" to assist with project activities. The project is also putting together invitation cards for cooperators/ demonstrators can use to invite colleagues and neighbors to local tours. Finally, the project is working to build relationships with the agribusiness community to extend the project's sphere of influence.

* Nebraska has been creative in inviting a variety of different interest groups, consultants and other organizations to participate in meetings of the local committees (held in the demonstration counties), the communications committee and the advisory committee. Benefits, in terms of public relations, access to radio resources and district-wide publicity have been valuable.

  The Nebraska project, as mentioned earlier, has also been successful in working with consultants as well as fertilizer and chemical dealers. A recent bus tour of the demonstration project was conducted for the fertilizer and agricultural chemical institute; the audience also included some state politicians. The project has done other major bus tours (with more than 100 participants each) during the past two years --

open to both legislators, agency people and producers.

In addition, the project has put together an interactive video and downing board display for use at the state and county fairs and captured public attention with its PSAs.

* North Carolina recently held an awards banquet with the Duplin County Agribusiness Council to express appreciation to cooperators for their participation in the demonstration project. A recent tour of the demonstration project area gained the vocal support of the Chair of the local county commission, who stated that he was very impressed by the project and pledged continued support for its efforts. Currently the project is trying to put together a speaker's bureau -- with the input of the local advisory committee -- that will supply speakers for school and civic club meetings who may be interested in learning about protecting water quality.

  At its inception, the North Carolina project had a media briefing/breakfast kick-off which was well-attended by area producers, agency leaders and media representatives. A project press kit was distributed to area and regional media, and the ES communication specialist developed additional "tip sheets" to help reporters develop stories relevant to the project. Signs, a highly publicized well-testing sequence, contact with area 4-H groups, are among the I & E avenues the project has used. The other states have utilized many ot these I & E strategies.

* Texas has had significant success in reaching several segments of the community. In the summer of 1991, the project had some educational sessions for 7th and 8th graders; these students were called the "conservation cowboys." This year the project expanded this idea into a four-day "conservation camp," at which speakers and educators will work with 34 7th and 8th graders to teach them about water quality protection and conservation practices. This type of outreach has garnered some good public support and publicity for the project.

  Exhibit booths, participation in area ag days, conducting tours for special interest groups (such as the Soil and Water Conservation District's annual ladies tour), and presentations at three-day teachers' workshops and the Lachland Airforce Base have significantly extended the reach of this project's I & E arm.

* The Wisconsin project has targeted numerous groups for I & E. These include ag lenders, environmentalists and conservation groups, area contractors, agribusinesses, cooperatives, and vocational-agricultural instructors. A new group the project intends to work with includes low-income farm families who may have "slipped through the cracks." The plan is to explain to interested people ASCS special provisions for accessibility/eligibility of program benefits.

  In addition to numerous demonstration activities, the project has placed a display at community banks, CRP meetings and ASCS offices (during sign-up time). In addition, the project participated in the Ag Materials and Handling Expo in Spring 1992. As in Minnesota, five Earth Team Volunteers are also available to the project -- two artists and three others to provide technical help.

  Finally, the Wisconsin project is putting together an informational handbook as a promotional tool -- to explain the project, its concerns, the practices it is promoting, and to highlight some historical information about the Green Bay area. This handbook could be very useful to civic and other interested groups wanting to learn about water quality and the mission of the East River project.

The above is just an overview and does not inclused all of the activities some projects are using to reach the public and their producer audiences.

3. Observations: Communication Campaigns

Who's in Charge and What's Happening?

Before delving into these questions, it may be useful to briefly discuss the concept "communication campaign." As communication researchers, we often perceive communication (or I & E) campaigns as proceeding out of a planned effort that takes into account audience segmentation, message composition, media outlets, an area's information environment, and timing of message dissemination. Ideally, some research and resources are expended to characterize the audience and the best ways of reaching it, with communication professionals dedicated to the I & E effort to better assure the success of the message reaching its intended audience.

In the real world, government agencies are dealing with fragmented resources and diversified job descriptions. Government employee work plans are packed with a variety of responsibilities and tasks, some of which are technical, some of which are public relations-related. People frequently have to

wear many different hats and shift their priorities daily.

With the real world in mind, it is not surprising that communication professionals are not dedicated full-time to these projects. Although, a few states have district or state level professionals with substantive amounts of time allocated in their plans of work to the demo projects, many I & E activities are carried out locally by ES and SCS agents.

So, how does the situation look generally? It appears that most I & E plans evolve out of a collaborative team effort of project and state personnel, usually including involved agencies. (The involved agencies may include natural resource district and other agencies, in addition to SCS, ES and ASCS.) Most project leaders and local project coordinators integrate I & E activities into their individual and project plans of work. I & E activities include generating of press releases and articles for the local print media, and newsletter writing as this can be fit into schedules. Some ES agents have weekly columns in the local media, in which they have an opportunity to discuss water quality BMPs, when appropriate. Occasionally, agents tape interviews for radio programs; however, this does not occur on a large scale.

In general, local agents are technically trained and focus more on demonstration activities than I & E activities (after all, they need to have something to talk about). To this end, the agents often work one-on-one with local producers and cooperators, attend local meetings and answer telephone inquiries. However, they are also adept at composing news releases, planning demonstration tours and writing newsletters. If they need assistance with (or to coordinate on) composition of press releases and planning I & E efforts, they may work with state level project managers and/or communications people in ES and/or SCS. This latter statement frequently applies if a press release is to be sent out to regional and national publications, with whom the state ES and SCS communication specialist may be more familiar.

In some states, communication personnel at the state or district level are available for consultation or assistance on I & E at the district or state level on a fairly consistent basis. This is not true for all states. Following is a composite summary of what is happening in each state.

In <u>California</u>, Stacy Roberts (Staff Research Associate/Water Quality Project Manager, located at the University of California) assists with generation of articles and press releases for regional publications. She also handles brochure development. Generally, Roberts and Jim Hill (one of the Coordinators of the project, also located at the University of California) assist Steve Scardacci (the University of California Farm Advisor (ES) working on the demo in Colusa County) whenever he needs to get information out on a more regional basis.

Steve Scardacci handles all local publicity, generates a newsletter (called "Cereal Briefs"), participates in occasional interviews, makes presentations at meetings, plans local demonstration tours, writes papers, and gets articles placed when and where possible. In addition, he's responsible for setting up the research and demonstration plots for area producers. I & E activities generally are incorporated into the regular flow of work, and occur on an ad hoc, or as needed, basis. Development of an I & E/communication plan does not appear to have occurred in any formal way. However, the project has gained some significant national attention and grabbed the attention of regional and national trade journals. Scardacci has been approached by trade journals for information about the project and provided articles as requested.

At this point, SCS personnel support to the project is limited because of a staff vacancy.

In Florida, local agents handle local publicity. At the state level, Julie Graddy, who has editorial responsibility with the Institute of Food and Agricultural Science (IFAS), assists the project with the development and dissemination of press releases and generation of a newsletter ("The Watershed Quarterly"). Her efforts are more regionally focused. State-level project coordinators, Brian McNeal (ES) and Ken Murray (SCS), in the midst of their other administrative duties also apparently contribute their energies to newsletter article writing and association and public meeting attendance. Their efforts have yielded some focused public networking on this project.

The split nature of the Florida project -- between citrus and vegetables -- requires I & E activities geared toward two different producer audiences. Two agents are in charge of these areas: Steve Futch, an ES agent working with the Citrus Research and Education Center, and Phyllis Gilreath, Ph.D., working with vegetable producers in Manatee County. Although their audiences are different, Futch and Gilreath tend to use the same communication vehicles to get the word out about the project. These include: newsletters, fact sheets, one-on-one communication, articles in scientific and trade journals, educational programs and public meetings. Futch and Gilreath both interact with chemical company salespeople, to educate them about IMPs. As mentioned earlier, Gilreath also works with the vegetable packing house managers to increase the reach of her newsletter and I & E activities. The citrus and vegetable newsletters are comprehensive with regard to technical information and also include listings of upcoming meetings and events. The educational thrust of the newsletters is obvious.

Because of the difference between vegetable and citrus production (results take longer to show in citrus production because of the long-term nature of tree growth/development), most

of the field days/tours done to date have focused on vegetables. In the future, they expect more tours will be done in the citrus component of the project. One obstacle to this, Futch pointed out, is the presence of citrus canker, which may prevent citrus growers from allowing people to walk through and randomly spread the canker. However, whether or not this will be the case later on is still unclear.

In Maryland, a communications committee (composed of ASCS, ES, SCS and district representatives) planned I & E efforts in 1991; however, this committee has largely dissolved in 1992, according to Sharon Hogan, ES Communications Consultant located at the University of Maryland. According to Hogan, the interagency committee no longer seemed to be needed as the Monocacy Project staff have assumed more responsibility for I & E (as their team developed) and took over generation of the project newsletter. It was also determined that the extra committee meetings were unnecessary because discussions of I & E were taking place at their quarterly meetings as they went through the plan of work and did progress updates.

However, in 1991 this communications committee was instrumental in getting the project's I & E efforts up and running. Committee membership included representatives from all the agencies involved in the project. I & E plans were made and follow-through responsibility was delegated at their meetings, to the most qualified person. Although the committee is no longer as formally organized, going into 1992, these personnel resources are still apparently available to the project, to be referred to on an as-needed basis.

All of the members of the communications committee and the Monocacy Project are proficient in farm terminology and cost-share, and seem to have an instinctive understanding of how to reach their audience. They know their audience because they have daily contact with it.

Hogan is the primary I & E coordinator for the project at the state level, and her job consists of many activities. Hogan assumes primary responsibility for larger media events and campaigns, and also assists other project team members with door-to-door identification of the area producers. She helps to generate press releases, as needed, and also monitors the two local newspapers to keep track of current issues in the target communities. In the last year, the project decided they needed to build up more awareness of the water quality issue and thus do more advance marketing in the producer population. Well-testing and utilization of the Farm-A-Syst instrument are being worked on at this point as part of the strategy to build awareness, as are other ongoing tours and demonstrations.

Looking over the activities of the Maryland project, it

would be correct to say that Sharon Hogan, the committee and project staff planned a coordinated communications effort during its 1990-91 tenure. This effort was jointly planned through the plan of work process.

Minnesota deliberately held back on its 1990-91 I & E campaign for the demonstration project for a number of reasons:

(1) The SP-53 project initiated prior to the demo project frustrated farmers because it was advertised early and cost-share became available later. The farmers became disillusioned with the government's "hurry up and wait" approach, and its way of making promises without delivering. The Minnesota team didn't want to repeat this mistake.

(2) The first year of the project was set aside for planning and setting up demonstrations. Training of BMP consultants and technical people has taken priority.

(3) Project coordinators want to have results to show to farmers before making a big splash in the press.

The emphasis, was on preparing all the team players and setting up demonstrations. Interagency communication was prioritized, with an interagency newsletter and committees set up as information vehicles. Press releases were disseminated, as appropriate. Communications proceeded from former ES project manager, Mike O'Leary's office (this position is now filled by David Cooper), with assistance from Dani O'Reilly (ES Public Relations Leader) and Mike Price (SCS Public Information Officer).

Currently, it appears that the new project manager, David Cooper -- hired in early 1992 -- is rapidly getting up to speed on all project activities. Project activities appear to be generated out of his and the Becker, Minnesota offices. (Becker is a hub of Anoka Sand Plan Project activity.) Local committees are generating press releases. The project still regularly distributes its quarterly newsletter -- which includes both meeting announcements and educational text. The 1-800 inquiry number is up and humming. The project efforts focus on developing connections with farmers and agribusiness.

At this time, the Education/Media committee is on hold until Cooper has acclimated to the overall project. New people have been hired in recent months to assist with the project, and this has required the integration of new team members into the project's workload. As these staff transitions are completed, a more integrated I & E effort is expected to evolve. For the time being, the project plans to focus on its farmer audience and continue the I & E strategies that were initiated in the last two

years.

Per interview information, it appears that the Minnesota I & E strategy has been deliberate, and the professionals handling the planning process have clearly reasoned out all their activities. The ES communications specialist in Minnesota is rich in practical knowledge about I & E, having held professional public relations positions in the private sector before joining Extension. The SCS professional, likewise, appears very competent. As time evolves and the team re-organizes around its new personnel, it is very possible the Minnesota communications effort will elaborate, although its steady, progressive approach with producers may be just what is needed because producers were disillusioned with the start-up experiences of the SP-53 project.

In Nebraska, 15 counties are participating in the demonstration project, although the UW research team is evaluating only two counties. Locally, agents handle press releases, write articles, and set up county demonstrations and field days. Most of these agents have their own newspaper articles in the local media; their efforts are individually paced and they all handle communications in their own way.

A significant media effort was occurring at the district/state level in 1990 through the Spring of 1992. This effort was especially focused in the South Central District, and led by Priscilla Pekas, Communication Associate with the South Central Extension and Research Center. Due to recent budget cuts, project funds were reduced. This reduction led to Pekas cutting her position to half-time, and then finally deciding to resign. Currently, no communications professional is working with the Nebraska project. Most I & E efforts are occurring at the local level, where county agents frequently have weekly articles in the area press, disseminate press releases, put together tours and work with local committees in their planning effort. According to Andy Christiansen, ES Project Coordinator, the significant ongoing county effort should suffice for the time being. The search for a replacement for Pekas's position is in process; however, one person expressed doubt about whether or not it would be possible to find a public information specialist for the South Central District offices willing to take a half-time position. However, the public relations foundation of the project is solid, and hopefully this will continue to contribute to general public awareness of the project in the following months.

During Pekas's tenure with the project, a significant coordinated effort occurred in I & E that incorporated community, media and other association/organization representatives on an I & E committee. The I & E effort was fairly comprehensive, incorporating a PSA campaign and the generation of glossy annual reports. The I & E effort has been a high priority for this project. How the budget situation will affect this project

remains to be seen.

North Carolina is something of an anomaly among the eight states under evaluation -- The demonstration project is located within a Hydrologic Unit Area (HUA), which is also funded by USDA for demonstration/educational purposes. (For information purposes, in the HUA, the purpose is to educate people about practices that have already been tested and proven effective. The demonstration project, theoretically, includes practices that are more intensive and newer technologically.)

In 1990-91 in the HUA, SCS Public Affairs Officer, Andy Smith assisted with I & E efforts, while June Brotherton, ES Agricultural Communications Specialist, assisted local agents in the demo project. County agents and district conservationists are handling press release dissemination, meetings, and article production locally. Articles and press releases to be distributed regionally appear to primarily be generated out of the state offices. Since the HUA and demo project share territory, Brotherton and Smith likewise combined ideas and energy. For this reason, the UW research team is closely monitoring both the HUA and demo project I & E efforts.

The I & E effort in North Carolina is fairly comprehensive. A kick-off and press kit was developed out of Brotherton's office in the initial stages. Both professionals worked with the media and have been in frequent contact with media people to ascertain their information needs. Their contacts with local staff, to stay apprised of their needs, were also frequent. Brotherton spent anywhere from 25 to 80 percent of her time on the demo project, and it was a priority to her. Smith's time is spread more thinly. However, the two communication specialists evidently coordinated their workloads to maximize their efforts.

More recently, Brotherton moved to a new position in the chancellor's office at North Carolina State University. This has left a gap in the I & E specialist position, which Maurice Cook, Ph.D. (project manager and extension specialist) is filling at this time. Currently, the project is maintaining its previous I & E strategy and focusing attention on building relationships within the local community and producer audiences.

The extent to which the I & E effort in North Carolina is a planned campaign effort unclear. As with most of the states, I & E strategies are integrated into the project's overall plan of work. Because information intitially flowed steadily between the state and local offices, and between the SCS and ES, it is also possible that many I & E plans may have been understood but not written down.

The Texas team has distributed communications responsibilities across a number of people. The primary project contacts, Robert Lemon (ES, located at Texas A&M) and Phillip Wright (SCS, located in the Seco Creek project office in Hondo, Texas) jointly decide what needs to be done and who is to do it. Although they have been active and creative in the I & E area, there does not appear to be a communications "plan" at work. Press releases are distributed either out of Extension or the Seco Creek office. Articles are included in local newspapers and occasionally in the San Antonio media and trade journals; interviews occasionally have been held on radio shows; and videos, slide tapes and PSAs are in the works and/or distributed. The project also has some impressive controlled media -- brochures and fact sheets -- available.

The project's I & E activities are very diversified. It has reached numerous and varied audiences through meetings and tours. Plans for the future include establishing of an evapotranspiration weekly update for farmers in one of the local papers. Articles have appeared in the trade journals (such as the Southwest Farm Press and The Progressive Farmer). Extension media people are assisting with the development of a second round of PSAs. Exhibit booths, talks at the Texas Section for the Society for Range Management, as well as the National Society for Range Management, have expanded the project's reach beyond the immediate area. As mentioned earlier, the project's innovative Conservation Cowboys (1991) and the Conservation Camp (1992) programs have also drawn significant public support.

Some state assistance in the information dissemination effort is offered by SCS public affairs officers, Micki Yoder and Martha Guerra; Martha Guerra has assumed more of this responsibility in the last year. Out of these SCS offices have come some excellent videotapes, according to Wright. ES has also offered valuable, ongoing state support.

Wright also mentioned that the project office sees a lot of walk-ins, people who come in to ask about the project and its programs. In addition, many local groups, schools and interested organizations have approached the project to set up tours or educational meetings. Project managers take both of these as good signs that the project is reaching the public with its message about protecting water quality.

Based on interview information, the Seco Creek project appears to be "hitting the mark" in its I & E efforts. This project appears to have successfully sold itself from the beginning; the public relations efforts of its initiators -- at both the state and local level -- seem to have paid off by giving the project some momentum, as well as by building enthusiasm for the project among staff.

The Wisconsin East River project is staffed by four people, three with ES and/or SCS experience. (This excludes the project secretary.) Prior to joining the project at its inception, the project's Education Specialist, Sandy Sickinger, had accumulated four years of ES experience as an ag agent specializing in crops and soils. Her I & E position encompasses a wide range of responsibilities, including helping to find funding for demonstration projects and planning I & E activities. The project has ambitious objectives and has attempted to reach a wide range of audiences, as mentioned above.

In terms of I & E, each demonstration tour or field day has its own set of communication activities and collateral materials. Sickinger primarily handles dissemination of press releases for tours and field days on an as needed basis. In addition, she has regenerated an out-of-date media mailing list, and set up lists of contractors with expertise in demonstration project activities (such as filling abandoned wells and removing underground storage tanks).

In the initial stages of the project, a great amount of energy was expended in project start-up activities and interagency team building. Based on available information, it appears that the problems experienced in the early stages of this project were reflective of poor communication and coordination between agencies that pre-existed the project's initiation. However, the last one and a half years have seen this interagency communication improve, and the project has steadily gathered momentum.

Both SCS and ES are providing assistance to the project's I & E efforts. Recently, a joint multi-agency effort, involving state and local project personnel, developed a comprehensive, long-term marketing plan, which details project objectives and potential methods to achieve them. The marketing plan provides some information (based on survey data) about the producer populations in the target area, and also provides insight into the various attitudes and factors influencing these focal producer populations. Some of the I & E methods proposed in the marketing plan are already being used by East River staff on an ongoing basis -- e.g., displays at banks and farm shows, tours, feature stories, presentations at area meetings, newsletter and other direct mail distributions (brochures, etc.). Adoption of other strategies suggested in the plan will be decided over time by East River staff and other involved leadership.

In addition to the media outlets mentioned above, SCS, ES, DNR and the National Farm Medicine Center in Marshfield combined forces to produce and distribute a well abandonment video, which is now available by loan or purchase to interested parties.

The I & E strategy assumed by the East River project appears to be diversifying in terms of community outreach/education. With regard to reaching its producer audience, the project has

conducted numerous tours and field days which have received attention in the local media and regional farm press. In addition, the project has valuable and growing contacts throughout the community farm industry via contractors, ag lenders and cooperatives.

The above project descriptions hopefully help provide a context for more detailed discussions of plans of work, media plans and communication strategies, following below.

Plans of Work/Media Plans

As mentioned earlier, Chuck Ullery, indicated that USDA directions regarding the water quality demonstration projects did not specify how projects were to conduct communication activities. (He also admitted that this area may need to be strengthened in the future.) In addition, a glance through the USDA Program Guidance and Format for Annual Reports reveals that major emphasis is placed on technical data collection, water quality monitoring and monitoring of BMP adoption. Mention of informational and educational activities is brief:

> "Report on all significant information and education activities undertaken to inform and educate project cooperators and other appropriate producers, organizations, agency staff, elected officials and the general public..." (p. 3)

This was the only mention of I & E activities in 5 pages of reporting directions.

The point of the above paragraph is this: The flexibility offered by USDA on communication and I & E endeavors may result in lack of prioritization of these areas in the state-run projects (being organized in light of USDA advisories and reporting structures), unless state and local managers are innovative and cognizant of the value of an organized I & E effort.

In most states, I & E activities are outlined in the state government's annual plan of work. Although project plans of work are not all on file, surveys of the available plans of work reveal that they generally include specific activities (such as breakfast meetings, slide show development, display building, etc...) and some attendance objectives set for meetings; however, they do <u>not</u> generally outline strategies for determining audience composition or message development.

Given this planning strategy, it is not surprising that I & E/communication <u>campaigns</u> with a life and theme of their own are not laid out per se. That is <u>not</u> to say that significant communication activities are not taking place. Many of the

events in these states are impressive and extremely well-carried out -- for example, Maryland's project kick-off was very well-organized with an impressive line-up of speakers, high media attendance, and a professional and comprehensive press kit. Newsletters are likewise sharply produced. In general, however, it does not appear that resources have been expended in thematic development, or the development of project "identity," as much as in the communication of technical information.

Factors that may contribute to limited long-term planning in terms of overall campaign development may include the following:

* Lack of planning time preceding project initiation;

* Limited financial resources available specifically for I & E (one agent claimed he had to use personal resources to get photographs printed and included in an information piece he was developing);

* Limited I & E professional support -- State and local level communications professionals are often distributed across multiple projects, and have fractured and shifting workloads which prevent them from having the time they need to do audience profiles and long-term planning for information campaigns.

Given trends in state and federal budget cuts, it is difficult to foresee how these factors will be addressed or if they will change.

Communication Campaigns

Based on interview and survey information, most of the projects are relying on the following outlets for message dissemination in concert with demonstration activities:

Public Media:

- News releases to, and some personal contact with, area daily and weekly newspapers; regional newspapers are contacted somewhat less frequently

- News releases to radio stations (television stations do not seem to be regularly targeted)

- Articles distributed to other agency/association newsletters, agricultural publications

- Occasional participation sought on area radio programs

Controlled Media:

- Pamphlets and brochures, some drafted specifically to

explain the project, and some previously available through either ES, ASCS, SCS or USDA

- Newsletters -- distributed to producers and some targeted at agency personnel, policy-makers and interest groups

- Signs posting announcements about entering the demonstration project area or designating demonstration farms

- Direct mail contacts with producers

- Slide and video presentations re: BMPs

- Displays, which may rotate around the area

Obviously, most of the projects are more heavily utilizing controlled media to get information to producers than public media. In "Getting the Word Out...A Handbook for Planning a Public Information Campaign" put together by University of Wisconsin -- Extension, the writers point out that "controlled media are likely to fit your needs, ... if your ... message is complex, if your audience is already identified on a mailing list, or if it is important to get across the details of your message in a specific way." (p. 14) Most of the information communicated on these projects is being directed at specific producer audiences and has the potential of being technically complex. Furthermore, most of the projects have at their disposal producer mailing lists (either generated by ASCS or other agencies), which facilitate taking a direct mail approach. Given budget constraints and the availability and practicality of relying on controlled media to get across complicated information, it makes sense that controlled media outlets are being used extensively on these projects.

However, the type of media outlet a communicator uses will also be contingent upon the purpose of the message: Is it to arouse awareness or to inform? Questions about purpose bring up an interesting point about these I & E efforts: the extent to which thought has been given to levels of problem recognition that may exist among audience members -- if producers are even aware that water quality problems may exist in their own backyards. If project organizers want to arouse problem awareness, public media may be the more appropriate vehicle.

Along these lines, the following examples are of value. In Maryland, the project has placed posters about the Monocacy River Watershed Project in feed and farm supply stores. In North Carolina (1991), they placed project brochures in brochure holders in grocery stories. In Nebraska, they initiated a radio PSA campaign, as well as an ongoing publicity campaign (via press releases) through print outlets to raise awareness in farm communities that water quality problems exist and they are being

addressed. Nebraska also announced selection of cooperators, just to inform the public that "Joe Schmoe has decided to do things differently this year...," in an effort to prime a community for the water quality project. In addition, Texas has distributed some PSAs about the project, and Texas, Wisconsin and Nebraska projects have put together displays for public viewing (other states may have done this as well). Finally, several of the states held project kick-offs, which were attended by public officials and drew media coverage.

For the most part, though, utilization of public media to arouse awareness or problem recognition appears less organized and primarily reliant upon press release (and some article) dissemination. One exception to this finding is the 1991-92 radio PSA campaign in Nebraska, where the PSAs evidently received frequent play because they are of high quality, recorded with well-known public figures. (This may also prove true for Texas, since they have just distributed their PSAs.)

If project managers feel their target audiences are adequately aware of water quality problems, they may not feel use of public media to heighten problem awareness is necessary. This is a question that requires follow-up.

However, there are also some other factors at work when discussing public media and the potential for projects to "use" them:

* The popular press is very difficult to access and may not be interested in ag or water quality issues;

* The definition of "newsworthiness" may be problematic when it comes to getting the word out about the projects. One interviewee complained that what's "news" to the press is often something that is going wrong, or the most recent agricultural disaster, not things that are going right or improving. Thus, accessing the press is highly difficult and unpredictable, especially in larger, urban communities.

* Furthermore, it takes time to develop press contacts and gain name recognition, if this has not been done in the past. New projects with new project leaders or I & E personnel may have to do some legwork to develop and finesse these contacts.

Projects with experienced public relations personnel or information specialists contributing time to them may have an advantage in getting information printed and aired by journalists -- (1) because of the contacts they already may have; (2) because they may have more experience in compiling information in a format compatible with the demands of newsrooms (because of newsroom time constraints editors often like to use information that is near publishable upon submission); and (3) they may have

more experience in pacing information dissemination. However, the data we have on hand regarding the advantages and disadvantages of having communications professionals dedicated to the I & E effort is not complete enough to draw any sound conclusions as to the above.

Thus, the above comments are offered in the vein of speculation. More research needs to be done to discern if the association of experienced communication professionals with the projects has any influence in terms of planning and information dissemination across the life of the projects.

Finally, in terms of how project personnel view their audiences -- one interviewee brought up questions about how accurately people in Extension view their farmer audiences, suggesting that Extension has a tendency to focus energy and effort on more affluent, educated and accessible farmers. However, two states have directly faced this question. Wisconsin has targeted low-income producers to help them interpret cost-share and other information, and Maryland has begun a door-to-door effort to identify producers in the community that may not be included on their maps or lists.

Audience Characterization

Project personnel perceive their farmer publics more accurately than outside observers who are unfamiliar with the farm area. They credit their farm audiences with a fair amount of sophistication and judgment, and perhaps with a high degree of environmental concern and awareness. However, concern and awareness about water quality issues may also be related to, or motivated by, non-environmental concerns. For example, it was pointed out that many farmers are sensitive to the dynamics of public image and the regulatory environment, and therefore may be more concerned about protecting water quality for purposes of averting negative press or legislation/regulation -- rather than solely for purposes of protecting or improving water quality.

Another factor which may influence concern levels among farmers may be perceived proximity of water quality problems. A report published in Maryland in 1990, (based on a sample of 280 farmers drawn from four agricultural regions in Maryland) stated that

> "Overall [farmers] felt that water quality was more of a concern elsewhere in the state than their own area. Water quality was perceived as a more severe problem at the state level than at the local level, and more severe at the local level than on-farm." ("Maryland Farmers' Adoption of Best Management Practices," p. 6, available upon request.)

Given this finding, might perceived proximity of the problem influence the level of attention producers pay to I & E campaigns? If the problem appears to be located far away, farmers may not be as concerned with evaluating/adopting BMPs to resolve water quality problems on their own farms or in their communities; the opposite may be true if farmers perceive a problem to be located on their farm or in their community. Therefore, it may be useful for project planners to clearly assess how proximate and salient water quality problems are among their farmer audiences, in order to determine which I & E strategies may most effectively bring these issues closer to home.

At this point, it is difficult to ascertain the degree to which project managers have directly confronted the issue of problem awareness, or if they are basing their campaign strategies on intuition and assumptions of high problem recognition. Further research also needs to be conducted to find out what factors contributed to the decisions project leaders made with regards to the use of public and controlled media, and if they have specifically targeted audiences to raise concern levels.

4. Demonstration and Tour Schedules

All the projects have had several tours and field days. The number and type varies across the projects. Below are highlighted <u>some</u> of the project activities that occurred and are planned in each state. Information in this area is still in-coming. The reader is also referred to the project newsletters, plans of work and annual reports for <u>detailed</u> information about tour and demonstration schedules.

In <u>California</u>, tours initially were targeted (1990-91) at various state agency and some media people, not producers (this is not unusual in the projects' beginning stages). In August of 1991, the project held a rice irrigation systems field meeting in Colusa County (the county under study by the UW research team); an additional rice field day was held in September, 1991. Attendance levels were good -- approximately 70 - 80 plus people attended these meetings. The project also has held a tour for out-of-state managers of various administrative programs concerned with pesticide management; water management field meetings; a tour for national ag leaders (who selected the water quality project as a tour site); and other Extension meetings discussed the project's BMPs. Field days and tours will be scheduled later in the summer and into August, and will include another field meeting for the water quality project.

In <u>Florida</u>, a tour on the fully enclosed irrigation system was attended by approximately 70 vegetable producers in the early stages of the project, and several field days and public meetings are occurring. The public meetings are open to growers,

environmental groups, advisory committees, water management district personnel and local administrators -- to name a few of the participant groups. (See Appendix B.4 for a copy of the Manatee Vegetable Newsletter, which provides a "flavor" of the meeting schedule.) The vegetable component of the project generally holds a field day each Spring and a different public meeting forum in the Fall. The citrus component of the project holds citrus production schools in the Fall and Spring. The schedule also includes a supervisory management school, as well as an environmental school. Issues discussed include fuel tank storage, nitrates in groundwater, and environment audits. Tour schedules on the citrus component, as mentioned earlier, may be contingent upon the presence of citrus canker and the willingness of growers to have people walk through their groves.

In Maryland, some of the tours of the project are directed at farmers, others at politicians and agency people... the two tour types are handled differently, according to the audience. According to Sharon Hogan (ES communications consultant), tours were so well-attended last year that people had to be turned away. Among other activities, the project held a major bus tour in July 1991 for farmers.

The project has a number of agendas, including the integrated pest management (IPM) program, nutrient management and a drinking water education campaign. The IPM program has tripled its enrollment since its inception two years ago.

Upcoming tours include one for the EPA (in July), a tour for the National Soil and Water Conservation Society (in August), among others for agencies and producers. The project also held a cooperators' luncheon this Spring to talk about last year and possibilities for next year in terms of demonstrations and tours. According to Hogan, the farmers shared some terrific ideas with the project.

In all three of the above states, difficulty in identifying cooperators initially hampered setting up demonstrations. Some of these problems related to: the regulatory environment (CA); the cost-share and long-term agreement situation (FL); and the cooperator nomination process (MD). However, in the last one and a half years, many of these initial identification problems have been resolved.

As mentioned earlier, Minnesota's initial efforts were primarily focused on training BMP consultants and setting up demonstrations. However in 1991, the Anoka Sand Plain Project held a dry land farming field day; two tours for decision-makers; a tour for ag business and chemical dealers; and a tour for potato growers. These tours and field days were scheduled in the Isanti and Sherburne County areas -- the focal counties of the UW research project. In total, 11 counties are participating in the Minnesota Anoka Sand Plain Project, and tours/field days will be held throughout these 11 counties.

More recently, the project has held two four-hour tours in the focal demonstration counties. Project manager David Cooper stated that some of the many tours have buses and provide lunches. (This is true for many of the states.) A November workshop is on the docket, as well. A major focus of the project is to get farmers as involved as possible in all aspects of the tours/project. Local organizing committees at the local level are working on tours and scheduling, and a planning meeting for next Spring is expected to be held in July.

In Nebraska, tours are organized by county agents across 15 counties, and an overall tour schedule is not available through the district office. The Wisconsin team is trying to keep apprised of the happenings in two counties: Adams and York. Most of the demonstration activities and tours for producers are planned by local committees.

In August 1991, a major tour was planned through the South Central District office, to which state agency and natural resource district people were invited. Buses transported 150-200 people to three demonstration sites in the south central district. (This tour was also held the previous year.) The project also held a bus tour for the fertilizer and agricultural chemical contingent, attended by fertilizer dealers and a couple of politicians. Tours have also been directed at agency personnel; consultants (two meetings); and producer groups. Tours are primarily scheduled in the Fall, with Adams County having a tour date set for September 1, 1992. Several other tours are occurring at the local level; schedules are evolving.

In North Carolina, tours and field days are largely planned by local personnel. In 1991, two tours were highly attended in Sampson and Duplin counties, and an additional tour about Integrated Crop Management practices was attended by approximately 100 farmers. (In addition to these two tours, others were scheduled and managed by local personnel.) On September 9 - 10, 1991, a technical tour and planning meeting was held for cooperators and agency personnel.

Other tour examples include a June 11, 1992 tour conducted for community leaders. Buses transported attendants to sites with a constructed wetland for animal waste control, a pesticide rinsing pad; swine waste management; soil control; integrated crop management; and home composting. A Fall tour is in the works, and Spring tours are being slated for project publicity and promotional purposes. Details about these tours are provided as they are planned.

The Seco Creek Project in Texas has put together numerous tours for varied groups of people -- as mentioned earlier in this report. The list that follows is just a sampling of project activities.

In 1991, the project co-sponsored the South Texas Irrigation

Conference; this conference addressed all aspects of irrigation. On January 24, the project held a prescribed fire workshop to discuss the basics of prescribed burning. On September 26, a brush management field day was held. Other 1991 activities include a May 29 program on sampling soil and water for fertilizer and pesticide residues, and brush management field days. Many of the above activities were continued into 1992.

Both 1991 and 1992 also saw civic meetings and workshops. As mentioned earlier, activities included the conservation camp for 7th and 8th graders, the ladies tour planned for the Soil and Water Conservation District, teacher workshop meetings, and other events. The May 1992 edition of the Seco Creek newsletter mentioned that "The project staff has conducted 44 programs or tours to over 1,700 people during the past year."

Starting in December 1990, the Wisconsin East River project has been busy with tours and field days. Examples of activities include well abandonment field days; a slide show about the project and the Farmstead Assessment System presented at Northeast Technical College to students and other audiences; pest management update meeting; agricultural seminars on milk pricing and profits, cutting herbicide costs, and other topics; an ag chemical field day; manure handling/management field days; planning for major improvements field day; participation in clean sweep programs; activities associated with the drinking water education program; outreach to limited resource individuals; presentations to various civic groups and conservation organizations; participation at the Ag Materials and Handling Expo (Spring 1992). Also on the docket are a farm progress day; a conservation practices tour; a management of vegetable filter strips meeting; and an alfalfa establishment tour. On-farm demonstrations are continuing and additional tour and meeting plans will be made on an ongoing basis.

The above are just a sampling of the types of activities that are going on in the various states. The projects are providing information on an ad hoc basis, as their schedules evolve. Interviews will continue to be a means of gathering information, as well.

It also is difficult to pin down field day and tour schedules for all the states for the following reasons:

(1) Schedules of what is occurring at the county level are not always available at the state level (communications offices); therefore, extra work is required to get schedules.

(2) These projects are still becoming accustomed to keeping us informed of their activities. For this reason we have requested to be placed on press release and newsletter mailing lists, so that when announcements are mailed out to the public, we will be informed as well.

5. Monitoring Activities

Although some projects mentioned in their plans of work that they intended to monitor their communications and demonstration efforts for effectiveness, they were non-specific about how they intended to proceed in this area. When asked in interviews, a few project communication specialists replied that they would rely on their "folks" to get word back on article placements. If money was available for clipping services, they may begin subscribing. As mentioned earlier, however, money is tight on these projects, and the Maryland project appears to be the only one that is monitoring the newspapers in the project area by subscription service. In short, communications practitioners appear to be relying primarily on word of mouth, levels of attendance at meetings, and "feel" to discern whether or not their I & E efforts are effective.

6. Discussion

A point made earlier in this paper is that I & E campaigns supporting the demonstrations appear to be loosely structured in most of the states under evaluation. Information about demonstrations, tours and field days appears to be disseminated mostly on an ad hoc basis, as these events are planned. Controlled media and public meetings appear to be the most heavily used outlets for informing producers about BMPs, and public media appear to be used primarily for purposes of informing producers about demonstration tours and field days (via press releases), but not always actively to prime the public about how the projects are addressing water quality problems and enlisting producer participation to resolve them.

Extent of farmer awareness and concern for water quality problems is a gray area. Many project planners and communication practitioners perceive their farm populations as fairly concerned and aware; however, there are no substantial data in most of these states to either confirm or deny this perception. A farmer's perception of the proximity of the problem, as pointed out in the Maryland study, may be crucial when it comes to paying attention to BMP information and making adoption decisions. Communication specialists and project managers may need to get a more accurate reading of awareness levels of their producer audiences. Many audience perceptions may be based more on "feel" than fact, and having more accurate information about their audiences may help project planners better structure and pace communication efforts.

Other factors that may influence adoption include cost-share amounts and availability and producer perceptions of government. Cost-sharing was only briefly discussed earlier; however, it is important to emphasize that some project planners believe the

availability of cost-share dollars is a primary motivator in BMP adoption, especially the more expensive BMPs. In Maryland, a manure pit can cost anywhere between $30,000 and $50,000. When cost-sharing is available at 87.5 percent of flat rates, farmers are (understandably) expected to be more likely to adopt this technology. However, other project planners have pointed out that the red tape of applying for cost-share dollars may be prohibitive to farmers when the practices require less financial investment. Some farmers would rather not work with the government if they can avoid it, and would consider the added personal expense worth the cost.

This brings up another factor that may influence how willing farmers are to adopt BMPs -- their perception of the message sender: the government. Maryland committee members characterized producer perceptions of the government as either luke-warm or negative, depending upon experience. This opinion was echoed in other states. It is unclear whether or not message senders have taken this opinion of government programs into account when they formulate messages to inform their publics of the BMPs being promoted by their projects.

Another perception, tentatively offered here, is that "messages" about some of these projects may need to be more clearly formulated... that the thrust of communication efforts has been more frequently on the practical aspects of the BMPs rather than on building <u>problem</u> <u>awareness</u> and selling the concept of protecting water quality.

At least some farmers may be "negatively inspired" to become involved in the water quality projects. Problem awareness, or the idea that there is a need to protect water quality, may be partially inspired by environmental groups (or the media) pointing fingers at agriculture as a problem source, and legislators/ regulators putting greater pressure on farmers through accelerating legislative/regulatory activity. Farmers are concerned about their public image and they want to avoid regulation. At times this may be what motivates them to walk through the doors of government offices looking for cost-effective, viable options. Therefore, farmers occasionally may be inspired to investigate and adopt BMPs because they are feeling cornered by the "opposition."

On the more positive side, farmers may become motivated to adopt BMPs because they see one of their own waving the "Let's Protect Water Quality" banner. One of the best things a project can do to build its own image is to enlist cooperators who have strong public images, are well-respected and get high yields off their land. In Nebraska, Andy Christiansen enlisted a cooperator who is well-known for getting the highest yields in his county (perhaps the state). People want to know how he does it. Christiansen mentioned that this producer was willing to work with the project, but did not necessarily want to be in the public eye... One day, a television crew went out to his farm to

talk with him about the demo project, and Christiansen says the cooperator turned into a "flaming environmentalist" right in front of the camera, talking about how farmers care about the land and care about protecting groundwater. Without intending to, he became a standard bearer for the farm community, and indirectly for the project. By enlisting the cooperation of such producers, a project strengthens its stance in the community. (The Maryland project has also used this approach.)

Elaborating this point further, Minnesota project planners are seeking to not only get cooperators to install BMPs on their operations, but also to build their enthusiasm for the project. By the fourth and fifth years of the project, Minnesota team members are hoping to prepare cooperators to actively participate in the education effort and perhaps take a more active role in the I & E campaign.

It appears that project managers have tried to seek out producers with strong public images as cooperators/demonstrators. However, it is difficult to discern at this point the strength of the public images of project cooperators. Those projects that 'plug' the producers and enlist both their enthusiastic <u>support</u> and assistance on the projects may end up having highly successful projects -- because farmers (like most people) are more likely to listen to their own kind than the government. By involving farmers in such a way, projects may manage to multiply the reach of their public relations efforts.

A number of factors have been considered that contribute to the effective planning and management of the demonstration projects and communication campaigns. These include:

1. qualified communications personnel contributing expertise to project planning efforts;

2. pro-active planning with clear objectives;

3. strong interagency communication where roles and responsibilities are clearly defined and follow-through is consistently high;

4. enlisting community leaders and respected cooperators to participate in demonstration activities; and

5. utilization of public media to build problem awareness.

Some of the projects are strong in the majority of these areas. It is important, however, to avoid ranking these projects against one another in terms of a questionable "success" criterion, because all the states vary in terms of the professional and personnel resources available to them. Most of them are doing what they can with the resources they have available, and are doing so in the face of budget cuts. Other factors which may influence how quickly and easily some projects

have progressed (relative to others) include the following:

- some states may have been able to mobilize project teams fairly quickly after project award and thus move their projects more quickly into the field; also,

- some states may have been able to piggy-back the demo project on top of other projects in progress or completed, such as SP-53.

These are just two of the factors which may have given some states advantages in moving projects forward.

In addition, projects that have some weaknesses in terms of personnel availability and organization may have the greatest struggle in harnessing resources for both their I & E and demonstration efforts. We need to look at the effectiveness of these projects in a reasonable context, given the logistical and personnel constraints that may have impeded their development.

Finally, it is also important to point out that the priority placed on developing creative and well-planned I & E campaigns (in support of demonstration efforts) at the state and local level may be a direct reflection of how much priority has been placed on the I & E area at the Federal level -- at the USDA. The USDA appears to have placed great emphasis on data collection and monitoring of water quality levels at the state level, but less emphasis on audience research, which looks at the composition of the producer audience or problem awareness, or on the potential positive impact of education efforts which may reap benefits <u>after</u> the projects are terminated in 1995. (The data gleaned from the University of Wisconsin study should provide some of this kind of information to the states as the results become available; however, having such information prior to project inception and I & E plan development would definitely have been a plus.) Given the USDA priorities communicated to the states via reporting requirements, it seems only natural that personnel and financial resources may be more likely to be funneled into technical pots.

Although the USDA and these projects want to accelerate adoption of BMPs among producers, there often does not appear to be a <u>long-term</u> (e.g., five-year), coordinated I & E <u>plan</u> in place (that <u>integrates</u> public media for dissemination of <u>thematic</u> messages with controlled media for communication of detailed information), or clear definition of audience problem awareness and concern levels. While some states have made significant efforts to integrate public and controlled outlets and develop thematic messages, budget cuts, personnel changes and conflicting time and resource demands have had impacts on project agendas and priorities. It also is possible that some of the problems in this area can be traced to what some have called a hasty planning and proposal process. Finally, lack of coordinated, long-term I & E plans may also reflect a lack of understanding about the

value and utility of a well-thought-out I & E campaign. In the future, the USDA and associated agencies may want to consider how they define I & E, and prioritize and use their resources most effectively -- a highly coordinated, planned I & E campaign may be of greater value than they currently perceive it to be.

Finally, to sum up across all the states, good planning, professional communications support, strong interagency communication, teamwork and removal of staff and cost-share obstacles may contribute most to setting up forward-moving I & E programs and demonstration projects. If any of these areas is weak, the projects as a whole, as well as their I & E efforts, suffer and project momentum declines.

7. Follow-up

Several areas identified in the course of this report require additional follow-up by the University of Wisconsin team. Among them are the following:

1. We need to be closely apprised of demonstration field day and tour schedules.

2. We need to continue surveying the regulatory and legislative environment which may, in effect, accelerate interest in and adoption of BMPs.

3. We need to survey communication strategists about the factors affecting their choice of strategies to reach their audiences. How do they perceive their audiences in terms of awareness and concern?

4. We need to continue monitoring the building of teamwork and interagency communication on these projects -- so crucial to their success and management.

5. Finally, how successful are the projects in harnessing the public relations value of the cooperators they enlist to participate? The cooperator may be a fundamental tool in creating a positive public image for the project.

SECTION 4: RESEARCH DESIGN AND METHODS

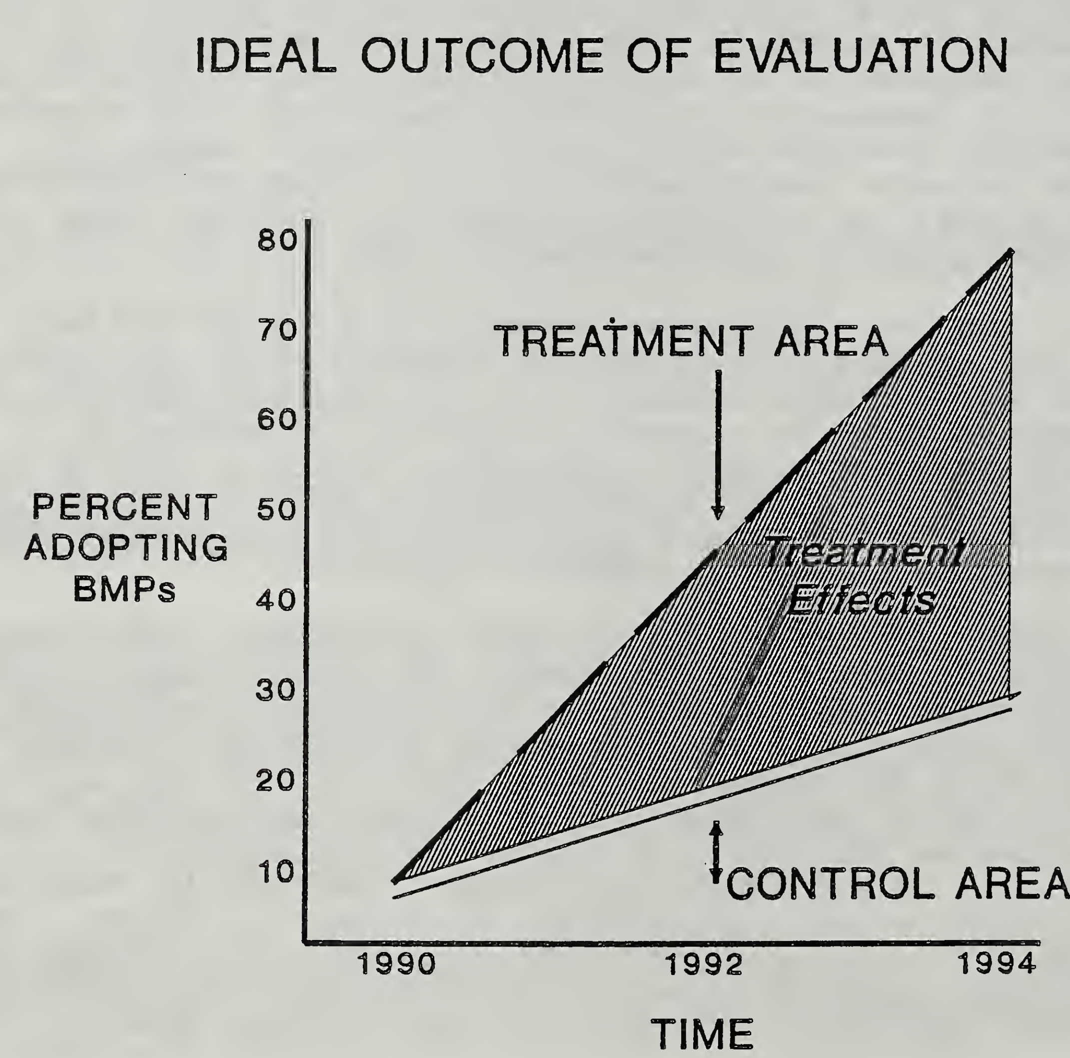
A. OVERVIEW

This evaluation is designed to determine the effectiveness of the of the U.S. Department of Agriculture Water Quality Demonstration program and state cooperators. This program is located in sixteen states around the country that have located water quality problems attributable to agricultural activities. The program addresses a range of objectives related to farmer awareness of these water quality problems and the use of various best management practices (BMPs) that farmers can use to alleviate degradation of water resources. The program objectives include: (1) increasing levels of awareness of, and concern about water quality problems among farmers in target areas; (2) enhancing farmers' understanding of techniques that could reduce these problems; (3) encouraging farmers to address these concerns through the adoption of water quality BMPs.

One of the key differences between the program and many other federal and state efforts aimed at reducing water pollution from non-point agricultural resources is the extensive use of **demonstration farms** as a central component of extension communication strategies or campaigns. The USDA expects that the demonstration of practical water quality BMPs on representative working farms in the target areas could be an effective mechanism for encouraging changes in farmers' behavior.

Our evaluation of the program has two primary objectives. The first is to determine the extent the efforts contribute to the accelerated adoption of water quality BMPs beyond that which would have occurred in the absence of any similar program. The rates at which the target audiences move through the adoption process reflects the effectiveness of the communication program and provides an indication of the social and economic acceptability of particular practices. Graphically, this basic research hypothesis is represented in Figure 4.1 below. The second objective is to measure the relative effectiveness of demonstration farms as dissemination mechanisms for communicating the salient attributes of selected water quality BMPs to farmers.

FIGURE 1


IDEAL OUTCOME OF EVALUATION
80
70
60
50
40
30
20
10
PERCENT ADOPTING BMPs
TREATMENT AREA
Treatment Effects
CONTROL AREA
1990
1992
1994
TIME

B. EVALUATION STUDY DESIGN

The basic goals of the University of Wisconsin team's evaluation research are to measure adoption across time by specified target audiences, account for practice demonstrations and other communication influences on this decision process, and then interpret the findings in such a way that it will enhance future technology transfer efforts. These three functions had to be accomplished in such a manner so as to be relevant to both individual demonstration sites and to national program efforts. Achieving these functions required an innovative research design.

In studies of the effectiveness of government programs, it is important to determine whether the changes that occur in the treatment population are directly caused by the implementation of the program, or are due to some other factors. True experimental conditions (present in the scientific laboratory) provide an ideal opportunity to attribute causality to a single isolated source. A classic or true experimental research design is one where cause and effect relations are investigated by exposing one or more treatment groups to one or more randomly assigned treatment conditions and then comparing the results to one or more control groups not receiving the treatments. In pure evaluation studies, which must operate in the complex 'real world' where true experimental conditions are lacking, quasi-experimental designs can be employed.

A quasi-experimental design is one where not all the relevant variables can be manipulated or controlled through random assignment of subjects to treatment or control groups. Instead researchers account for differences between the treatment and control groups through careful measurement of a wide range of relevant variables. Therefore, while quasi-experimental designs suffer from certain inherent limitations, that have been discussed elsewhere (Campbell and Stanley, 1963; Lipsey, 1990), careful attention to research design and analysis techniques can overcome many of these shortcomings (Isaac and Michael, 1981; Cook and Campbell, 1979).

The present research design allows for the tracing of economic, cultural, social and environmental changes within each site milieu that could contribute to patterns of awareness, knowledge, evaluation, and adoption of water quality BMPs. The relative impacts of these factors on the dependent variables will be examined within both the program sites, as well as within carefully selected control areas. This will allow inferences to be made concerning not only the influence of each type of factor independently or additively, but also interactively with demonstration project stimuli. Such analyses will subsequently allow more precise recommendations to be made about the types of demonstration materials deemed most effective across a range of

economic, cultural, social and environmental situations.

The local project staff at each site have identified the geographic boundaries of their treatment sites. Farmers living in these areas will potentially be exposed to the treatment (the program). The difficulty facing the evaluation team involves the attribution of changes in the use of water quality BMPs among the treatment farmers to the unique effects of this particular program. In the design of our study, we have attempted to account for the possible influence of non-treatment variables through **the use of a comparison area** and **careful measurement of other important exogenous variables.**

Initially, we have overseen (in conjunction with the project site coordinators, see below) the selection of comparison areas that are as similar as possible to the treatment areas in each of the eight states. Comparison groups provide the analyst with an estimate of what would have happened to the treatment population <u>in the absence of the treatment program</u>. If we assume that the farmers in the control areas begin at roughly the same levels of awareness and concern about water quality problems, and are familiar with and use water quality BMPs to the same extent as the farmers in the treatment areas, we can look at the differential rates of change on each of these dimensions between treatment and control groups as an estimate of the true "project effect".

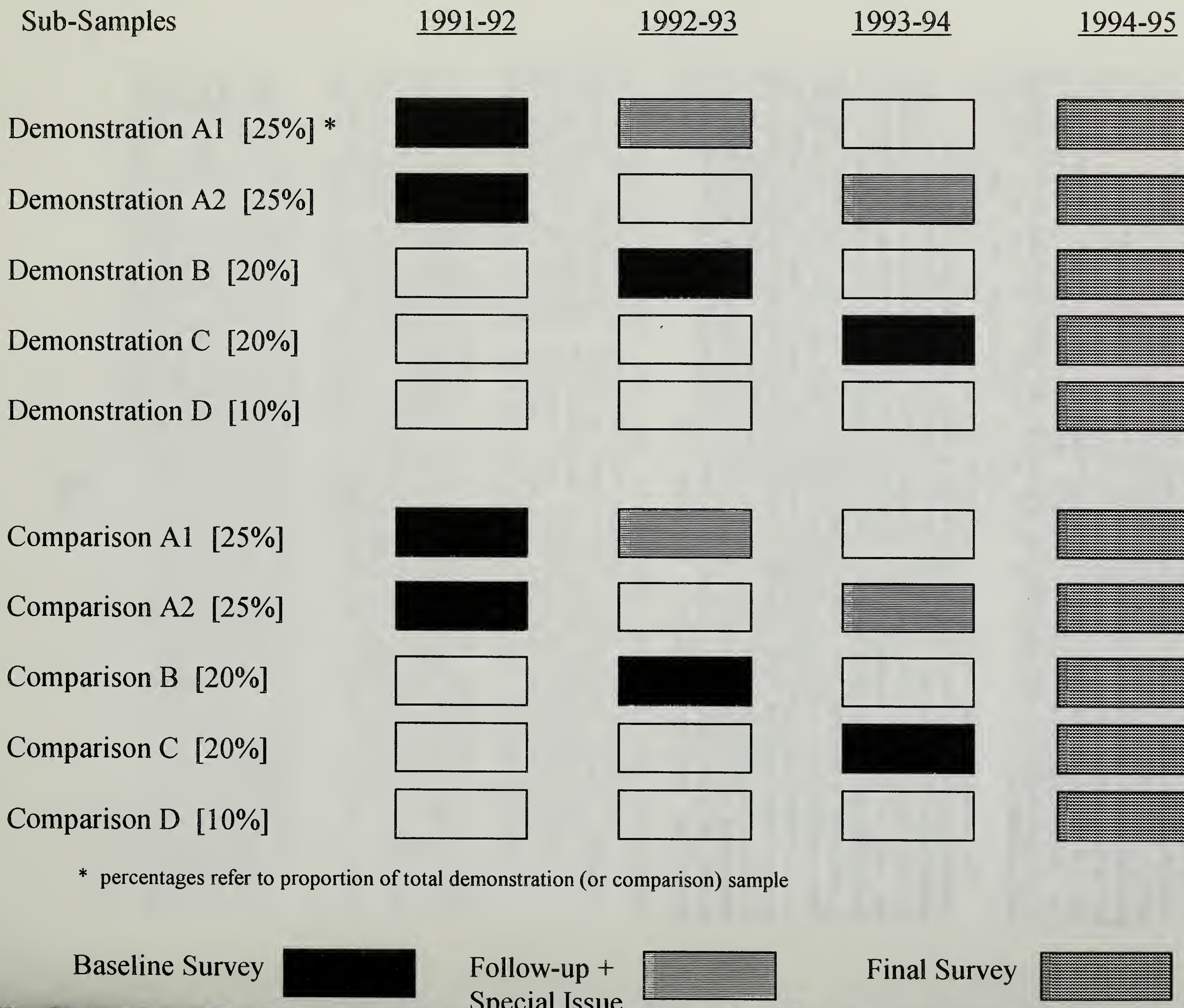
In the ideal case, the **only** differences between the treatment and control populations would be exposure to the treatment program. Obviously, this is rarely the situation. As a result, we intend to measure differences in initial conditions and background variables between the treatment and control farms throughout the study period. This allows for statistical controls where exact control groups are absent or impractical.

At the analysis stage, we will incorporate information on the different characteristics of the treatment and control groups in any statistical manipulation of the data. Using analysis of covariance and multiple regression methods, we should be able to distinguish the effects of the USDA/WQD program from the confounding effects of other background variables (Cochran, 1983; Neter, Wasserman, and Kutner, 1989).

To this end, we are employing a variation of the Separate Sample Pretest/Posttest Control Group Design (see Campbell and Stanley, 1963:55-56). Essentially, this design involves several steps: (1) the identification of a treatment and population for each site; (2) the selection of a probability sample of farmers from within both treatment and control populations; and (3) the random assignment of the sampled farmers to subgroups within both treatment and control groups.

The variations on this basic model that we are employing are illustrated in Figure 4.2 below. In particular, we will be dividing the overall sample into five different subgroups (denoted Treatment A_1, A_2, B, C, and D and Control A_1, A_2, B, C, and D, respectively). These subgroups will be sampled over four points in time (both groups A_1 and A_2 were included in the 1991-92 baseline survey). Because this design allows us to collect follow-up information from already tested groups, in addition to the data collected from previously untested groups, we will be able to isolate any pretesting effects on the responses of repeat respondents.

The evaluation team will contact farmers in the treatment and comparison areas at four points in time: an initial baseline survey in the winter of 1991-1992 (which has been completed); a set of follow-up and special issue surveys in 1992-93 and 1993-94; and a final survey (of all farms) at the conclusion of the USDA/WQD program in January 1995. As mentioned above, the treatment and control subgroups (A_1, A_2, B, C, and D) which enter the evaluation study at different time periods will be utilized to account for any instrument reactivity and/or learning effects due to the use of the survey instrument at an earlier period. To illustrate, note that farms in subgroup A_1 will continue to be surveyed at times 2 and 4, while farms in subgroup B will be surveyed for the first time in time 2, and will be included in the final survey at time 4 (Figure 4.2).


Sub-Samples
1991-92
1992-93
1993-94
1994-95
Demonstration A1 [25%] *
Demonstration A2 [25%]
Demonstration B [20%]
Demonstration C [20%]
Demonstration D [10%]
Comparison A1 [25%]
Comparison A2 [25%]
Comparison B [20%]
Comparison C [20%]
Comparison D [10%]
* percentages refer to proportion of total demonstration (or comparison) sample
Baseline Survey
Follow-up + Special Issue
Final Survey

C. General Sampling Procedures

1. Population Estimates

Each of the eight USDA/WQD sites under study was assumed to have a well-defined target population for their demonstration activities. Generally, these targeted populations were selected on the basis of their location (usually farms situated within a given watershed) and their farm enterprise characteristics (in some cases farms producing particular commodities will be specifically targeted). Definitions of these "demonstration populations" were therefore dependent upon local project goals and decisions. In general, we utilized these definitions of demonstration populations from local projects to determine the boundaries for our sample of "demonstration farms".

In two cases (Florida and North Carolina), we elected to identify two different demonstration samples. In each case, the actual demonstration projects were targeted directly at a very small group of farms (the 'central demonstration areas'), but were likely to be influencing a larger group of farms (the 'surrounding demonstration areas'). As will be discussed below, we had to identify the populations in each group in order to draw a proportionately sized sample and ensure reliable comparisons. In our analysis below, we provide summaries for the central demonstration farmers, the surrounding demonstration farmers, and for the combined sample of both types of demonstration farmers (where appropriate).

Once we had defined the appropriate target populations, it was necessary to identify a corresponding control population for each state. The major function of the control or comparison sites is to help assess the extent to which demonstration efforts accelerate the adoption of water quality BMPs. As we mentioned in our research design report in October of 1990, the selection of the control populations was guided by the following criteria, listed in descending order of importance:

i) **Physical distance from the treatment area** (to minimize the chances that the control population is aware of or influenced by the USDA/WQD program).

ii) Similarity to the treatment population in the following respects to the extent possible:

a) **Geophysical Environment** (including similar soils, topography, surface and groundwater hydrology, vulnerability to water quality problems, overall land use mix, etc.)

b) **Farm Structural Characteristics** (including the predominant farm enterprise or commodity mixes, distribution of farms in different size classes, the importance of farming to the local economy, demographic similarities, etc.)

c) **Communication Characteristics** (type of mass media market mixes, nature and extent of extension contacts, nature and extent of previous or ongoing water quality communication efforts, etc.)

Because of practical limitations, it was decided not to select <u>individual</u> comparison farms on a one-to-one matching basis. The pragmatic difficulties of matching individual farms in a study of this magnitude make such an approach difficult and financially impractical. This is consistent with the recommendations of Campbell and Stanley (1963) and Isaac and Michael (1981:99). Rather, we attempted to identify comparison areas that were <u>in aggregate</u> similar to the treatment areas. The location of each <u>control population</u> was determined in consultation with local project staff, and by other individuals knowledgeable about the local situation.

The final population estimates for each demonstration and comparison group are listed in Table 4.1 below. Detailed discussions of the origins of population estimates are included in the state-by-state summary text that follows.

2. Sampling Considerations

Identification of the demonstration and comparison populations was only the first of several steps leading to the final list of farm operator names and addresses used in the first wave of the survey. Based on these population estimates, we utilized statistical tools to estimate the approximate sample sizes necessary to make comparisons among the various sites. Furthermore, because of suggestions from USDA staff, we developed and elaborate and innovative geographic-based sampling methodology to identify fields (and their related farm operators) inside both demonstration and comparison areas. These techniques are summarized below.

Sample Size

To determine the overall size of our samples, we initially used statistical power analysis to ascertain the approximate **minimum sample size** from each demonstration or comparison site that would be required to ensure statistical validity. We chose to set the probability of a Type I error (the α-level) at 0.05 and the probability of a Type II error (the β-level) at 0.1. These levels conform to those commonly used in this type of evaluation study. Because the dependent variables of interest in this study are numerous and varied, we decided to use a standardized version of the Effect Size (ES) level, which we set equal to 0.4 standard deviations from a group mean. This implies that we have a 90 percent chance of detecting true treatment effects as small as 0.4 standard deviation units for the various dependent variables of interest. Using these assumptions and algorithms developed by Lipsey (1990), and assuming a virtually infinite population size, we determined that we would require a minimum useable sample size of 130 farms. Assuming a response rate of 75 percent, we determined that roughly 175 farms from both treatment and control populations at each site (for a total of roughly 2800 farms) would be required at minimum.

Although the above calculations provided a rough guide to the minimum sample sizes in each state, we recognized that we would want to make comparisons between certain subgroups of farmers within the demonstration areas (e.g. comparisons between "central" farmers living within the main demonstration area and those "surrounding" farmers living in nearby areas; also between farmers who produce different commodities). Moreover, the actual population sizes of demonstration or comparison areas varied considerably between and within states. As a result, we wanted to ensure that sampling error rates were held constant across subgroups in the samples. To achieve this goal, we utilized a conservative estimate[1] for the mean probabilities for use of water quality BMPs (the primary dependent variables). Based on our estimates of population for each demonstration and comparison group, we then calculated the total sample which would be necessary for each group and subgroup in the study (See Table

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[1] We assumed that p=0.5, with variance equal to v(p)=p(1-p). The formula for sampling error was drawn from NCPRI (1973):

$$SE(p) = sqrt\ ((1-n/N)*((p*(1-p))/(n-1)))$$

We found that holding SE(p) constant at 0.03, we would allocate the treatment samples in the proportions found in Table 1. This value for the sampling error is relatively conservative for this type of study, but give the large number of dependent variables of interest and possibilities for compounding error rates, we felt it was necessary.

4.general 1 below). This procedure produces a sampling fraction that is inversely proportional to the size of the target population at each site; in other words, one needs to sample a smaller fraction of the population at the larger demonstration sites in order to achieve the same estimated level of sampling error. Statistically, this provides the most efficient use of our finite resources and the greatest probability that we will detect true differences due to the treatment program.

Once we determined the overall sample size which we needed from each group, we proceeded to adjust these sample sizes to account for an expected 75 percent response rate. This adjusted sample served as the basis for the number of surveys we felt we had to send out to each subgroup in each state. We then allocated the adjusted sample across the four time periods in our 5-year longitudinal study (refer to discussion of research design above). In essence, we have taken the total number of surveys which we expect to send out and randomly[2] assigned cases into the A, B, C, or D subsamples. The proportion of the total sample in each subgroup is 50:15:15:20 (in other words, fifty percent of the sampled units (the A-subgroup) were surveyed at time 1 (1991-92), and the remainder will be surveyed at intervals that are discussed in the research design section above.

The sample of farms for the first wave of the survey (1991-92) was completed in November, 1991, and surveys began to be mailed to these farm operators in December, 1991. The population estimates and sample sizes which we utilized in wave 1 are presented in Table 4.1 below.

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[2] To be more precise, we generally utilized one of two procedures to allocate individuals into these subgroups. In situations where we had accurate and reliable ASCS maps and tract boundaries, we utilized a pseudorandom, systematic procedure to select tracts for the initial sample (as well as for the later samples). In situations where we were forced to utilize expert lists, or where tract boundaries were unavailable, we attempted to systematically select names at regular intervals off the list for each sample group. This procedure is more fully described below.

Table 4.1
Population Estimates and Sample Sizes
USDA Water Quality Demonstration Evaluation Project

SITE:	Population Estimate	Unadjusted[1] Overall Sample Size	Adjusted[2] Overall Sample Size	Actual[3] Wave 1 (91-92) Sample Size
		(number of farm operators)		
CALIFORNIA				
Demonstration	400	165	219	114
Comparison	none	none	none	none
FLORIDA				
Demonstration (subgroups)				
(a)	52	44	52	26
(b)	9	9	9	5
(c)	132	90	132	66
(d)	57	49	57	28
subtotal:	250	192	250	125
Comparison (subgroups)				
(e)	23	20	23	12
(f)	36	34	36	18
subtotal:	59	54	59	30
MARYLAND				
Demonstration	380	161	215	118
Comparison	475	176	235	118
MINNESOTA				
Demonstration	550	185	247	124
Comparison	355	156	209	103
NEBRASKA				
Demonstration	1589	237	316	201
Comparison	80	62	80	40
NORTH CAROLINA				
Demonstration				
(g)	63	56	63	63
(h)	6	6	6	6
(i)	930	215	286	115
(j)	35	35	35	35
subtotal:	1034	312	390	219
Comparison				
(k)	70	56	70	70
(l)	6	6	6	6
subtotal:	76	62	76	76

Table 4.1 -- continued
Population Estimates and Sample Sizes
USDA Water Quality Demonstration Evaluation Project

SITE:	Population Estimate	Unadjusted[1] Overall Sample Size	Adjusted[2] Overall Sample Size	Actual[3] Wave 1 (91-92) Sample Size
		(number of farm operators)		
TEXAS				
Demonstration	239	129	198	96
Comparison	343	154	205	114
WISCONSIN				
Demonstration	845	210	280	128
Comparison				
(m)	330	151	202	126
(n)	325	150	200	98
subtotal:	625	301	402	224

NOTES:

1 = Total Sample Surveys (returned) required for each population to keep sampling error constant at SE(p)=0.03.
2 = Adjusted for estimated 75 percent response rate.
3 = Wave 1 Sample surveys sent out -- approximately 50 percent of total sample.

(a) = Citrus growers, Lake Manatee Watershed only
(b) = Vegetable producers, Lake Manatee Watershed only
(c) = Citrus growers, Manatee County (excluding Lake Manatee watershed and area west of I-75)
(d) = Vegetable producers, Manatee County (excluding Lake Manatee watershed and area west of I-75)
(e) = Citrus growers, Eastern Palm Beach County
(f) = Vegetable producers, Eastern Palm Beach County
(g) = Farmers, Herrings Run Demonstration Project
(h) = Poultry producers, Herrings Run Demonstration Project
(i) = Farmers, Hydrologic Unit Area (excluding Herrings Run Demonstration Project area)
(j) = Poultry producers, Hydrologic Unit Area (excluding Herrings Run Demonstration Project area)
(k) = Farmers, Sampson county comparison area
(l) = Poultry producers, Sampson county comparison area
(m) = East Winnebago watershed comparison site
(n) = Bear Creek watershed comparison site

Sampling techniques and procedures

In our original proposal, we understood that it would be the responsibility of local project managers to generate a list of names, addresses, and telephone numbers for all relevant farms that lie within the boundaries of the treatment area. Using these master lists, we proposed selecting a systematic random sample of treatment farms at each project site to include in our study. On the suggestion of USDA personnel in Washington, however, we were encouraged to utilize an alternative geographic-based sampling procedure that might mitigate some of the biases associated with the use of official lists. More specifically, we selected a stratified systematic unaligned sampling technique. The use of this more elaborate procedure entailed significant increases in the labor and resources devoted to the sampling process. However, it does present advantages over a simple list-based sampling scheme.

The Spatial Sampling Process

When sampling land surfaces, a simple random sampling design provides equal probability that each point on the surface could be selected. However, random sampling may not give a thorough coverage of the sample area, leaving spatial gaps (Yates, 1981). A systematic sampling design across space selects points for inclusion at regular intervals. While this provides more complete coverage of an area, the regular spacing of the sample may cause a bias by over or under representing periodic phenomena (Griffith, 1987).

Designs for location sampling have attempted to combine the positive aspects of both techniques and minimize the negatives (Holmes, 1967). Berry and Baker (1968) developed a technique that benefits from the spatially unaligned aspect of random sampling, while providing the blanket coverage of a systematic sample. The general design for this stratified systematic unaligned sampling had been used earlier by Berry (1962) for studying agricultural land within floodplains.

Past uses of unaligned systematic techniques, such as the geologic uses cited by Krumbein and Graybill (1965), the knight's move latin squares quadrat design of the USDA National Resource Inventory, and Berry's studies have focused on land cover/physical attribute inventories.

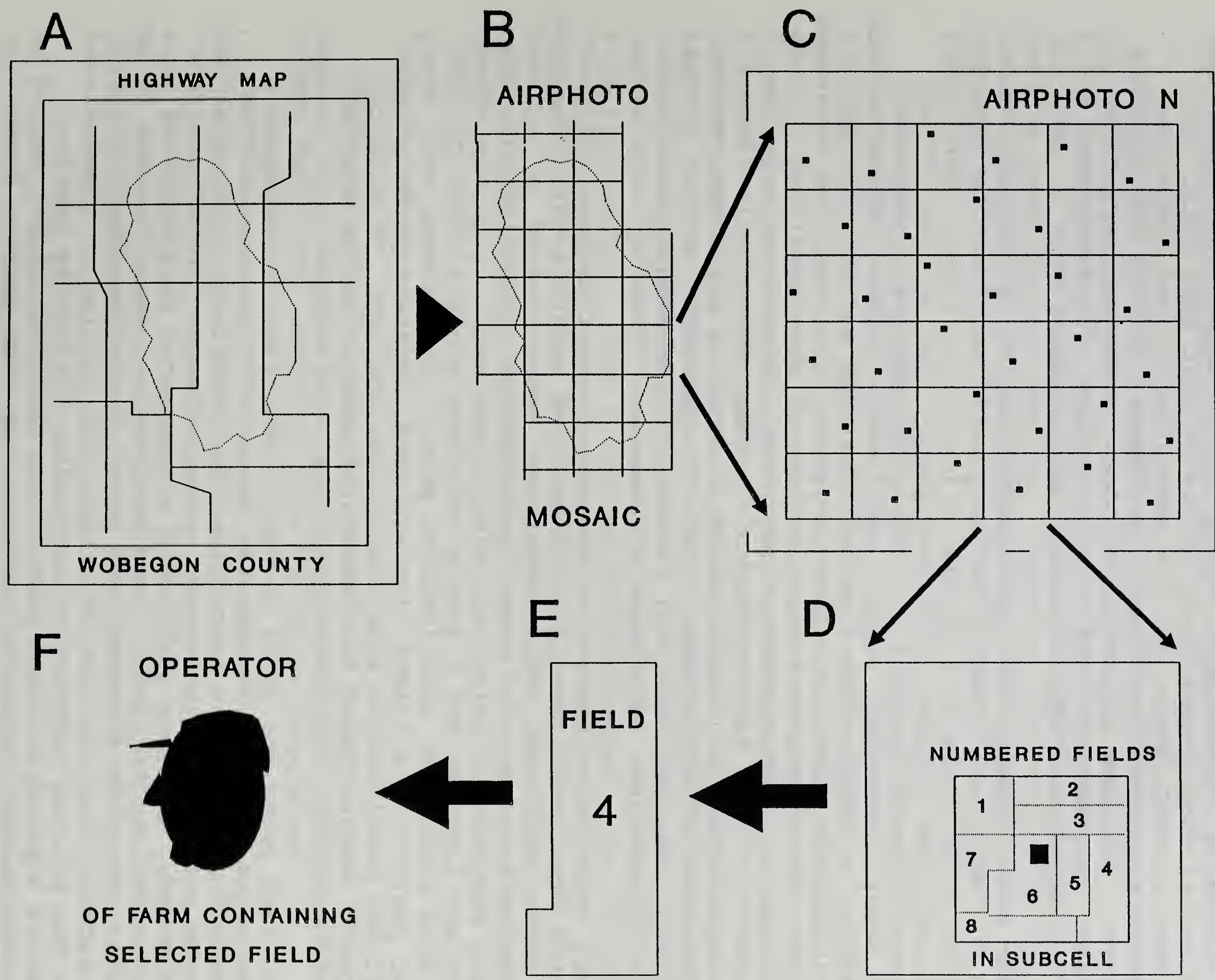
The stratified systematic unaligned sampling technique was utilized for this evaluation of water quality projects study. However, in this case, the design was not used to inventory physical phenomena, rather it was used to define operators of farms which contain fields identified by the technique. It was used to sample people.

Herein this spatial component of the sampling process will be referred to simply as "spatial sampling." The general procedure used for the spatial sampling is shown in Figure 4.3. Some modifications of this procedure were made according to the requirements found at each site. Specific modifications to the general procedure are detailed within the state-by-state sampling summaries.

Map and Photograph Sampling Base

Local staff at each of the eight sites were asked to provide a suitable map base showing the boundaries of each demonstration area (see step A on Figure 4.3). Boundaries of comparison areas meeting the criteria already described were also drawn on these maps. Because of the geographic nature of the sampling technique, it was important that all final base maps had some type of accurate spatial reference coordinates. Maps from sites having Public Land Survey System (PLSS) land divisions showed the section, township, and range reference system. Sites without the PLSS provided detailed county highway maps or USGS quadrangle maps with Universal Transverse Mercator (UTM) coordinates in meters and/or latitude and longitude in degrees. Map scales ranged from 1:24,000 to 1:120,000.

Aerial photography was needed as a visual base for the spatial sampling grid. For comparative sampling across all eight sites we knew that we would need a large number of aerial photographs. Consistently good photographic quality was important. The photography had to be at a reasonably accurate and uniform scale across all eight sites to allow us to identify individual crop fields. Maximum land coverage per photo dollar had to be tempered against the need for a visually usable scale somewhat smaller than 1:36,000 (1 inch=3,000 feet). Small fields of less than five acres can be discerned on photos at this scale. The photos also had to be reasonably up-to-date, cloud free, without snow cover, and be deliverable under demanding time constraints.


A
HIGHWAY MAP
WOBEGON COUNTY
B
AIRPHOTO
MOSAIC
C
AIRPHOTO N
D
NUMBERED FIELDS
1
2
3
4
5
6
7
8
IN SUBCELL
E
FIELD
4
F
OPERATOR
OF FARM CONTAINING
SELECTED FIELD

Black and white National High Altitude Program (NHAP 1980-1987) and National Aerial Photography Program (NAPP 1987-Present) aerial photography best fit these requirements. Latitude and longitude coordinates of each site were used to obtain the corresponding index maps of aerial photo flight lines from the ASCS Aerial Photography Field Office in Salt Lake City, Utah. The most current photos for the demonstration and comparison areas were ordered from these line indexes by roll and exposure numbers. Since we did not want stereo coverage, every other exposure was ordered along the flight line. This provided full uninterrupted coverage and minimized photo overlap.

For seven states, NHAP photography originally shot at 1:60,000 scale was blown up 2.53x by ASCS to a final 24 inch by 24 inch print scale of 1:24,000 (1 inch=2,000 feet). For California the original NAPP photography shot at 1:40,000 was enlarged 2.00x to a final 20 inch by 20 inch print scale of 1:20,000 (1 inch=1,667 feet). Small crop fields of three to four acres can be distinguished on both the NHAP and NAPP photos. Nearly all the final photographic prints were rectified to within one per cent of promised scale by ASCS in Salt Lake City. Rectification compensates for scale variations due to airplane nose tilt (x axis tilt) and airplane wing roll (y axis tilt). Approximately 15,000 square miles of land and water are covered by these aerial photographs. This is equivalent in size to well over twice the amount of all farmland in Maryland, according to 1987 figures (U.S. Department of Commerce, 1989).

All drafting on the photos was done in various colors of durable Stabilo-All pencil which has good contrast with the black and white background and is erasable. Boundaries of demonstration areas and comparison areas were penciled onto the aerial photographs using each site's base map as a guide. Each photo was lettered and a simple reference map was drawn to show the area covered by each lettered photo. Even though only every other photo in the flight line was used, adjacent photo prints still had considerable side overlap and end lap. To make the airphoto mosaic (see B in Figure 4.3) usable for the spatial sampling process, this overlap had to be eliminated.

On each photo one large rectangle was drawn to encompass a unique area of land coverage for that photo. Because of the photo end overlap, the rectangles sequentially shifted up or down on each photo along the mosaic column of each flight line. In some photos, airplane crab (nose of plane not parallel with flight path due to wind) caused some photos along the same flight line to be slightly skewed from a N-S, E-W orientation. These two factors required some stretching and pulling of linework and made the piecing together of rectangles similar to putting together a picture puzzle rather than merely joining a series of the same centrally-located rectangles on each photo. Each rectangle directly abutted the rectangles for the unique areas

drawn on each of the surrounding photographs. This adjoining network of rectangles covered the entire demonstration or comparison area without interruption or overlap of ground coverage between photos. Only the area inside these rectangles was considered for use in the spatial sampling process.

Before the spatial sampling grid could be drawn onto the photos, the number and size of the individual sampling cells had to be calculated. To do this it was first necessary to determine the area to be included in the spatial sample. Sampling in nonfarm areas was not desired. Therefore, an early step was to determine the size of the farmland area within each site. Farmed areas were considered to be the usable areas for spatial sampling.

Since the necessary sample size of farm operators was a reflected the density of farmers actually operating in the farming area, it was important that the usable spatial sampling area not be dramatically over or under calculated. Usable spatial sampling areas for each site were measured using a clear plastic template marked according to photo scale with 1/4, 1/4, 1/4 section (10 acre) quadrants. The template was laid down and moved sequentially across the photograph and 1/4 sections were tallied. Sizes of partial quadrants along boundary edges were estimated using the template guide. The resulting estimates of usable area for each site were rounded to the nearest 0.25 square mile (160 acres). Each tally was double-checked. The following visually discernible land cover types were not counted as part of the usable area: lakes and large rivers; contiguous parkland, forests, or wetlands; and urbanized areas. These land cover types do not contain agricultural fields which farmers are likely to operate.

Number of Sample Cells

Before the spatial sampling grid could be drawn onto the spatial sampling area on the aerial photos, the number and size of the individual sampling cells had to be determined.

For later work with inferential statistics it was important that the samples be chosen with as close to an equal probability of choice for all commercial farm operators regardless of the size and number of farm parcels which they operated. One problem which arose in assuring equal probability is that we had no *a priori* knowledge of who operated the land upon which our sample points fell.

Because we did not know exactly who was tied to each parcel, we chose a spatial unit as a sampling surrogate, the individual farm field. We attempted to carry out the spatial sampling so

that each identifiable farmed field on the aerial photos had an equal probability of being selected for our sample. The chosen **field** would be within a specific **farm** which had a **farm operator.** The idea was to derive a number of cells, which would each contain one sampled field. The operator of the farm containing that field would then be captured in the sample. The procedure was to give us a final list of separate names and addresses equal to the overall adjusted sample for the site.

Since we did not know who farmed which field, it was quite conceivable that an operator could be "hit" by multiple sample points if they farmed parcels which were separated across more than one sample cell. The spatial sampling process essentially sampled "blindly," with replacement (of operator), across space. How often an individual operator is "hit" in a spatial sample depends upon a number of factors: a) how many separate pieces of land the farmer operates, b) the size of the piece(s), c) how (disperse) far apart the pieces are, d) the number (density) of sampling points used, and e) the size of the contiguous farm piece(s).

Since we wanted to include each farmer only once in our final sample, this problem of redundancy had to be addressed. It was not possible to ascertain how disperse the farm pieces were. After consideration, solving this problem by looking at sizes of pieces was also not the answer. (Size of each piece will be addressed further as it relates to probability of selection). The most workable method to address redundancy appeared to be to somehow use the concept of how many pieces of land the farmer operates. To compensate for getting the probability of sampling the same farmer more than once, the number of sampling cells was increased beyond the number of farmers we wanted in our overall sample. Some of the added sampling cells would yield new farmers not yet chosen by another cell.

The User Services Branch of ASCS in Washington provided us with farm statistics for each county containing a water quality project. A simple guide for countering this redundancy effect was utilized using these figures. We realized that these numbers reflected ASCS records, but thought that they could provide the most legitimate guide available in our effort to solve the redundancy issue.

Farms per farmer was used as a multiplier for the desired overall sample size at a 75% response rate. For all sites where it was used, this multiplier increased the number of cells drawn beyond the number in the overall sample.

(Farms/Farmer X Overall Sample #) - Overall Sample # = Cells to add.

Since this farms/farmer guide was aggregated to the county level (the farms could be anywhere in the county), the added number of

cells was reduced according to the proportion of the county which was in the spatial sampling area.
The state-by-state summaries show how the farms/farmer redundancy guide was further tailored for the specific requirements of each site.

Once the number of sampling cells was determined, the size of each cell in the sampling grid could be calculated. To do this the square mile size of the spatial sampling area for each site was divided by the number of sampling cells required. This resulted in a cell size in terms of square miles. The fraction of one mile for each side of the square sampling cell was then calculated. Using the scale of the aerial photos for the specific site, the sides of the sampling cell were converted from mile fractions to inches using the following steps:

square miles/# cells = cell size

cell size $^{1/2}$ = mi per cell side

(mi per side X photo scale) = size of square cell in inches

Drafting the Sampling Grid

A grid of correctly-sized sampling cells was drawn in black permanent marker on a clear acetate base for each individual comparison and demonstration site which was spatially sampled. The clear sampling grid was taped to a large light table. The photos were placed over the clear grid and the grid lines, which were easily visible through the photos, were traced onto the spatial sampling rectangle on the photo surface. Care was taken along join lines of sampling rectangles to accurately draw partial sampling cells which overlapped from one photo to the next.

An extremely simplified format for the spatial sampling procedure was found in Clark and Hosking (1986). In concept, the aerial photos remained joined as one contiguous mosaic of the spatial sampling area. One sample point was to be generated in each of the sample cells (see step C in Figure 4.3). X and Y coordinate increments were in 1/10 of an inch from the lower left corner of each individual sample cell. At this increment, points could conceivable fall at 200 foot intervals across the landscape. This meant that on the NHAP 1"=2,000' photos, every acre of land had a possibility of being hit by a point. Points were placed within each cell using a template cut from a lithographed hardboard graph with lines at 0.10 inch increments. A right angle guide placed over a square opening in the template was used to triangulate the point placement.

The X and Y coordinates for the first sampling point were

chosen from a standard random number table. This first sample point was placed in the uppermost left hand corner sample cell (key cell) of the entire mosaic. The **X** coordinate from the key cell was assigned to each cell across the entire top row of the photo mosaic. New Y coordinate values were randomly assigned for each cell across this top row. The **Y** coordinate from the key cell was assigned to each cell in the leftmost first column. New random X coordinates were assigned to each cell in this first column.

For the cells in all succeeding rows of the mosaic, the **X** value was taken from the leftmost cell in the row and the **Y** value was taken from the topmost cell of the same column. The resulting sample points were thereby systematically stratified, one point per cell. This ensured a spatially dispersed set of sample points. Since the points were also unaligned from cell to cell, the spatial autocorrelation problems caused by regular periodicity were also minimized.

Selecting Sample Fields

The problem of including a disproportionate number of large parcels in the sample also had to be addressed. This size dependence factor is a factor in any type of spatial sampling where real units are not all the same size (Unwin, 1981; Larson, 1986). In any given cell, the probability of hitting any particular farm parcel was proportional to the area which the parcel occupied in the cell. Therefore, large parcels had a higher probability of being included in the sample. To mitigate the parcel size effect, a square subcell was drawn with each sample point as the centroid (see step D in Figure 4.3). The subcell was scaled to be 1/4 of the average farm size for the county containing each site. The same hardboard graph was used to make each subcell template. Agricultural fields within the subcell were counted and each mentally assigned a number. A categorized listing of random numbers was created using Minitab (release 7) on the UW social sciences DEC VAX/VMS computer. A random number suitable for the range of fields counted was picked from this listing. The field assigned to that number was chosen as the sample field for that sample cell (see step E in Figure 4.3). Each field so chosen was outlined in Stabilo-All pencil.

Because the fields were finally chosen randomly, they could more likely be associated with any sized farm parcel. Using this technique, the bias towards larger farm parcels caused by using the sample point as the field designator was lessened.

A random starting cell was selected and then the sample field in every other cell along a cell row was highlighted with flourescent marker. The resulting approximately one-half portion of the sampled fields was used for the 1991 sample.

Getting the 156EZ Forms

The substantive goal of the sampling process was to get a list of names and addresses for the operators farming these spatially dispersed fields(see step F in Figure 4.3). By cooperative agreement with ASCS we made site visits to the county level ASCS offices in the project and comparison counties. During the site visits, the ASCS 156EZ forms for the farms containing the sample fields were obtained. Detailed instructions were written for each site in order to carry this out. Members of the Wisconsin team took the spatially-sampled aerial photos along with supporting maps and materials to the local ASCS offices. The general procedure for obtaining the 156EZ forms follows (substantial differences from the procedure are mentioned in the state-by-state summaries). Most of the local ASCS personnel were indispensably helpful in carrying out this procedure.

The county ASCS offices have large aerial photos with ASCS Farm Tracts outlined and labeled with I.D. numbers. An ASCS Farm Tract is a contiguous farm parcel having one owner. The Wisconsin team aerial photos were compared with the ASCS office aerial photos and the Farm Tract numbers were recorded for each Tract encompassing a sample field. Each ASCS Farm Tract may be part of a larger ASCS Farm. The ASCS Farm is not necessarily a contiguous unit of land and represents the parcels in which a particular operator has an interest. There can be multiple ASCS Farm Tracts within the same ASCS Farm. The ASCS Farm which included each listed ASCS Tract was found by computer, and the 156EZ form for that Farm was generated.

List of Names and Addresses

The 156EZ forms contain a large amount of information. Name and address of operator, farmland acres, cropland acres, and a list of Tracts associated with the Farm were entered into a Microsoft Excel spreadsheet upon return to UW-Madison. Each resulting list was alphabetized by last name and the expected duplicate names and addresses were eliminated from the final mailing list. This involved process yielded 26 mailing lists to cover the demonstration and comparison areas and subpopulations at each of the eight sites. The name and address lists were mail merged with separate letter files for the advance letters, surveys, reminders, and other correspondence.

3. State by State Summaries

California

Population Estimates

Demonstration

The project demonstrations are being conducted in Colusa, Glenn, and Yuba counties. In those counties, according to the 1987 Agricultural Census, there were 400, 264, and 114 rice farms respectively. After discussion with local staff, we decided that we would focus our survey work on Colusa county only. Colusa county is the most important rice growing county in this area, and the demonstration projects in this county were better organized and established than in the other two counties.

Comparison

It was decided that there would be no comparison area for California, since no suitable area could be identified.

Sample Size

Assuming a population of 400 rice growers, and holding sampling error constant at se(p)=0.03, we determined that a sample of 110 farms would be adequate.

Sample Selection

The survey targeted rice farmers. The rice growing region of the county is predominantly east of the Tehama Colusa Canal. This region was used as the spatial sampling area. The area east of Interstate Route 5 was covered by 1987 NAPP aerial photos. NHAP photos (1983), obtained with assistance from the UC-Cooperative Extension, covered the remaining portion of the spatial sampling area westward to the Tehama Colusa Canal. Two separate spatial sampling grids were used due to the scale differences between these two sets of photos.

We did not know if every sample point would fall on or near enough to a farm with rice for a rice field to be included in the sample. Some sample cells would likely contain farms without rice fields. The number of sample cells was expanded by 25% because of this likelihood of capturing non rice farms in the sample.

Farms/Farmer		Non Rice Factor		Overall Sample Size		Approx # of Cells		1991 Fields		Rice Farmer 1991 Names
(1.4)	X	(1.25)	X	(220)	=	385-400	-->	200	-->	114

Farms per farmer were approximately 1.4 (with no proportional reduction since the rice growing area of the county was considered to be equivalent to the spatial sampling area). Overall desired sample size for rice farmers was 220. Fields in approximately one-half of the sample cells were used for the 1991 sample, so 201 crop fields were highlighted on the photos for the 1991 sample. Farms without rice which were captured by the spatial sampling, were identified and excluded from the final list of farms during the site visit. The 1991 sample fields yielded 114 separate names and addresses of rice farm operators from the 156EZ forms provided during the site visit and by mail communication with the Colusa County ASCS office.

The goal of the sampling process in 1991 was to provide 50% of the overall sample number of rice farmers:

(.50) (220 rice farmers) = 110 separate names and addresses.

Desired # 1991 Names	Sampling Yield 1991 Names	% Difference
110	114	+3.6%

The sampling process yielded 114 names and addresses of rice farmers, or 52% of the overall sample number of 220 rice farmers.

Florida

Population Estimates

Demonstration

Demonstrations in the Florida project focus on two different populations of farmers: vegetable and citrus growers. All of the actual demonstration farms are, strictly speaking, within the Lake Manatee Watershed, in Manatee county. Because this population is quite small, and because demonstration publications and activities will be targeted to a wider area, we decided to treat all vegetable and citrus growers in the eastern 3/4 of Manatee county (the area east of highway I-75) as our relevant "treatment" population. As a result, we drew separate samples for the populations inside and outside of the watershed. This allows us to compare farmers who live inside the actual Lake Manatee watershed with those in surrounding areas also affected by the demonstration. Utilizing this distinction, as well as

that between citrus and vegetable producers, we have divided the demonstration populations into four groups.

The sources for our estimates of populations varied according to the particular group in question. For citrus growers in Manatee County, we determined that the best population lists were available from the County Property Tax Assessor's office. Their lists indicated a total of over 700 tax parcels on which citrus groves were planted. After eliminating duplications, we devised a master population list of 184 names, of which 52 were in the watershed, and 132 were in the surrounding area. For vegetable growers, we utilized lists of commercial vegetable farmers, and a list of minority or resource poor farmers, both of which were obtained from the local county vegetable crops extension agent, Dr. Phyllis Gilreath. These lists included 9 vegetable growers inside the watershed, and an additional 57 nonduplicate names located outside the watershed, but still in the extended demonstration area. In each case, local staff (Joe Bruska, Jack Creighton, Phyllis Gilreath, Steve Futch, and Mark Law) identified the farmers who operated land within the boundaries of the actual Lake Manatee watershed.

Comparison

The comparison area was identified by state-level project staff (particularly Ken Murray of the Florida SCS). This area encompasses the vegetable/citrus production zone of eastern Palm Beach County. Because of the inadequacy of ASCS records, we were forced to utilize a variety of sources to construct an expert list of citrus and vegetable producers in the Florida comparison area.

The citrus growers in Palm Beach were identified using a combination of: ASCS aerial photographs and records; plat books and records from local tax assessors office, and lists from the county extension office. A Wisconsin staff member compiled these sources of information and consulted with the long-time local citrus extension agent, Clayton E. Hutcheson, to eliminate redundancies and verify the accuracy of the records. Vegetable growers names and addresses were obtained by triangulating records from a similar mix of sources: ASCS aerial photographs and lists; plat books and records from the county tax assessors office; and lists of commercial growers and minimum-input/resource-poor farmers from the county extension office. Again, these lists were compiled and redundancies eliminated with the assistance of local extension staff (in particular, the vegetable crops extension agent, Ken Schuler).

The use of these various records resulted in a final estimate of 23 citrus growers, and 36 vegetable producers in the comparison area.

Sample Size and Sampling Procedures

Because the population sizes were so small, we were forced to consider the entire population in each group as the overall sample. During the first wave we sent surveys to 50 percent of the farmers on our lists. We identified the actual wave 1 sample by flipping a coin to identify the starting point on the alphabetized list and taking every other name on the list thereafter. In the Lake Manatee Watershed demonstration area, we sent surveys to 26 citrus and 5 vegetable producers; in the expanded Manatee county demonstration area (excluding the Lake Manatee watershed proper), we sent surveys to 66 citrus growers and 28 vegetable producers. In the comparison area, we sent surveys to a total of 12 citrus growers and 18 vegetable producers.

Maryland

Population Estimates

Demonstration

The Monocacy River Watershed Water Quality Demonstration Project includes the Israel Creek and Linganore Creek subbasins. Except for a small portion of Linganore Creek, these two subbasins lie almost entirely within Frederick County. A list of producer names was compiled by Maryland SCS and demonstration project staff. These lists provided excellent estimates of population, but because of the subsequent change to spatial sampling, the lists were not used as a sampling base. After examination of the 500 demonstration area farms listed, we estimated that approximately 25% were duplicates. This lowered the estimated population in the two demonstration subbasins to approximately 380 producers.

Comparison

The comparison area, Catoctin Creek subbasin in western Frederick County, is separated from the demonstration project by a small mountain range. The comparison area producer list provided by the local staff contained 767 names. An approximate 40% reduction due to duplication gave us a round number estimate of roughly 475 producers in the subbasin.

Sample Size

Demonstration

Assuming a population of 380 producers, sampling error at se(p) = 0.03, and a response rate of 75%, we determined that an overall sample of 215 producers would be adequate for the demonstration area.

Comparison

With a population of approximately 475 producers, se(p) = 0.03, and a 75% response rate, a sample of 235 producers was sufficient for the comparison area.

Sample Selection

Demonstration

The area of the Israel Creek and Linganore Creek subbasins within Frederick County was used as the spatial sampling area for the demonstration project. The spatial sampling grid was drawn on 1981 NHAP aerial photos.

This region is experiencing extreme pressure from subdivision and large lot "hobby farm" development. The number of sample cells was expanded significantly, by 40%, because of the likelihood of capturing nonfarm parcels.

Farms/Farmer		Non Farm Factor		Overall Sample Size		Approx # of Cells		1991 Fields		Producer 1991 Names
(1.4)	X	(1.4)	X	(215)	=	415-430	-->	211	-->	118

Farms per farmer were approximately 1.4 (with no proportional reduction since many areas of the county are not engaged in production-oriented agriculture). Overall desired sample size for producers was 215. Fields in approximately one-half of the sample cells were used for the 1991 sample. Therefore, 211 fields were highlighted in the two demonstration subbasins for inclusion in the 1991 sample. These 211 fields yielded 118 separate producer names and addresses. The 156EZ forms for the farms containing the chosen fields were obtained during the site visit and via repeated mail communications with the Frederick County ASCS office.

The goal of the 1991 sampling process was to provide 50% of the overall sample number of producers in the demonstration area.

(.50) (215 producers) = 108 separate names and addresses.

Desired # 1991 Names	Sampling Yield 1991 Names	% Difference
108	118	+9.3%

The sampling process yielded 118 names and addresses of demonstration area producers, or 55% of the overall sample number of 215 producers.

Comparison

The sample selection process was carried out in a similar manner in the comparison area. The 226 highlighted 1991 fields yielded 118 separate producer names and addresses.

Farms/Farmer		Non Farm Factor		Overall Sample Size		Approx # of Cells		1991 Fields		Producer 1991 Names
(1.4)	X	(1.4)	X	(235)	=	445-460	-->	226	-->	118

The goal of the 1991 comparison area sampling was to provide 50% of the overall sample number of producers.

(.50) (235 producers) = 118 separate names and addresses.

Desired # 1991 Names	Sampling Yield 1991 Names	% Difference
118	118	0%

The sampling process yielded 118 names and addresses of comparison area producers, or 50% of the overall sample number of 235 producers.

Minnesota

Population Estimate

Demonstration

The Anoka Sand Plain Demonstration Project area includes the sandy soil associations in the two contiguous counties of Sherburne and Isanti. According to the 1987 Census of Agriculture statistics for these two counties, 933 farms produced at least $2,500 worth of agricultural products. Roughly 60% of the agricultural (nonforest, nonurban, nonwildlife preserve) land is comprised of sandy soils. Assuming an even distribution of

farms, this yields (933 farms) X (.60 sandy soils) = 550 farms in the two county demonstration area.

Comparison

The comparison area comprises the area of sandy soil associations in Wadena County. According to the 1987 census, there are 538 Wadena County farms which produced at least $2,500 worth of agricultural products. Roughly 66% of the agricultural land has sandy soils. The estimate for farms in the comparison area is therefore (538 farms) X (.66 sandy soils) = 355 farms.

Sample Size

Demonstration

With a population of approximately 550, sampling error held at se(p) = 0.03, and a response rate of 75%, an overall sample size of 247 operators was adequate for the demonstration area.

Comparison

Assuming a population of 355, se(p) = 0.03, and 75% response rate, the overall sample for the comparison area was calculated to include approximately 209 operators.

Sample Selection

Demonstration

The area within Sherburne and Isanti Counties comprised of sandy soil associations was used as the spatial sampling area for the demonstration project. The spatial sampling grid was drawn on 1984 NHAP aerial photos for both counties. Because of the similarity and contiguity of the counties, they were sampled using the same sized grid.

Considerable portions of the land within conservation areas was actually in farms. For example, according to the aerial photos, approximately 25% of the wildlife refuge area in Isanti County was farmed, and over 16 square miles of farmland existed within designated parks in Sherburne County. This farmed land was taken into account to make sure a large enough number of fields were generated during spatial sampling. To assure an adequate number of sample cells, a generous 75% proportion of the county was used in the equation (instead of 60%) to derive the number of sample cells needed in excess of the overall sample size.

Farms/Farmer	Area Proportion	Overall Sample Size	Approx # of Cells		1991 Fields		Operator 1991 Names
1.3	.75	247	295-310	-->	150	-->	124

Farms per farmer were approximately 1.3 (average of 1.2 Isanti and 1.4 Sherburne). The overall desired sample size was 247 operators. Calculation for potential sample cells to add was (1.3 farms/farmer X 247 operators) - 247 = 74 potential sample cells to add. Approximately 75% of the county was in the spatial sampling area, so (.75 area) X (74 potential new cells) = 56 new cells were added over the 247 sample size. The number of sample cells was therefore approximately (247 sample size + 56 new cells) = 303 sample cells.

Fields in approximately one-half of the sample cells were used for the 1991 sample, so 150 crop fields were highlighted on the aerial photos in the two county demonstration area. These fields yielded 124 separate operator names and addresses. The 156EZ forms for the farms containing the sampled fields were obtained during the site visit with the ASCS offices in Isanti and Sherburne Counties.

The goal of the 1991 sampling in the demonstration area was to provide 50% of the overall sample number of operators.

(.50) (247 farm operators) = 124 separate names and addresses.

Desired # 1991 Names	Sampling Yield 1991 Names	% Difference
124	124	0%

The sampling procedure yielded 124 names and addresses of demonstration area farmers, or 50% of the overall sample number of 247 farmers.

Comparison

The sample selection was carried out in a similar manner for the Wadena County comparison area. Essentially, a proportional area reduction guide was not used in Wadena for the same reasons already described. There also appeared to be a number of fields captured by peripheral cells at the perimeter of the outlined area because of the narrow and undulating protrusions of the sandy soils into these cells. The 125 fields highlighted yielded 103 separate farm operator names and addresses for the 1991 sample.

Farms/Farmer		Area Proportion		Overall Sample Size		Approx # of Cells		1991 Fields		Operator 1991 Names
(1.1)	X	(1)	X	(209)	=	230-250	-->	125	-->	103

The goal of the 1991 comparison area sampling was to provide 50% of the overall sample number of operators.

(.50) (209 farm operators) = 105 separate names and addresses.

Desired # 1991 Names	Sampling Yield 1991 Names	% Difference
105	103	-1.9%

The sampling process yielded 103 names and addresses of farmers in the comparison area, or 49% of the overall sample number of 209 farmers.

Nebraska

Population Estimates

Demonstration

The Mid-Nebraska Demonstration Project area includes Adams and York Counties. The 1987 Census of Agriculture identified 729 farms in Adams and 860 farms in York County which produced at least $2,500 worth of agricultural products. Combining the two counties, there was a population of 1589 for these types of farms. Interestingly, there were 525 farms with irrigation reported for Adams and 391 such farms reported for York County.

Comparison

The comparison area covers roughly 60 square miles among the eastern border of Gosper County. Demonstration project staff reported that there are approximately 80 operators within the comparison area. Gosper County provides a good match in soils, water, and cropping systems to the demonstration area. The 1987 Census lists 198 farms with irrigation in the county.

Sample Size

Demonstration

With a combined population of 1589, sampling error again at se(p) = 0.03, and a response rate of 75%, an overall sample size

of 316 farm operators was adequate in Adams and York Counties. Of these, 145 were from Adams County and 171 were from York County.

Comparison

This is a small population of only 80 Gosper County operators. With the 75% response rate and a sampling fraction approaching 1:1, the sample size needed essentially equaled the population size of 80. Therefore, the whole population in the comparison area was included for study.

Sample Selection

Demonstration

The agricultural land area in Adams and York Counties was used as the spatial sampling area for the demonstration project. Separate spatial sampling grids were drawn on the 1984 NHAP aerial photos for each county. Since nonfarm areas measured from the photos amounted to less than 1% of each county, no proportional area reduction was made in either county.

It was obvious from statistics provided by IRMD, User Services Branch of ASCS, that many of the farmers in the demonstration area were operating on more than one parcel of land. Farms per farmer hovered around 2 in both counties. Yet, by doubling the number of cells beyond the overall sample sizes of farmers, we would have been expecting that we were 100% likely to hit each farmer twice in our spatial sampling. This did not seem reasonable, so a lower but still significantly expansive figure of 1.4 (40% redundancy) was used in both counties.

ADAMS COUNTY

Farms/Farmer		Redundancy Factor		Overall Sample Size		Approx # of Cells		1991 Fields		Operator 1991 Names
(2.1)	X	(1.4)	X	(145)	=	190-205	-->	97	-->	90

YORK COUNTY

Farms/Farmer		Redundancy Factor		Overall Sample Size		Approx # of Cells		1991 Fields		Operator 1991 Names
(2.0)	X	(1.4)	X	(171)	=	235-250	-->	121	-->	111

Overall desired sample size for farmers was 145 in Adams and 171 in York County. Fields in approximately one-half of the sample cells were used for the 1991 sample. In Adams County,

this yielded 97 highlighted fields, with 121 highlighted fields in York County. These fields produced 90 separate names and addresses in Adams and 111 separate names and addresses in York County. The 156EZ forms for the farms containing the 1991 sample fields were obtained with the help of the Adams and York County ASCS offices during the site visits.

The goal of the 1991 sampling process was to provide 50% of the overall sample number of farm operators in the two county demonstration area.

(.50) (145 + 171 farm operators) = 158 separate names and addresses.

Desired # 1991 Names	Sampling Yield 1991 Names	% Difference
158	201	+27.2%

In essence, we slightly oversampled in the demonstration area. The sampling process yielded 201 names and addresses of demonstration area operators, or 64% of the overall sample number of 316 farm operators. The somewhat higher than expected number of operators seems to suggest that the number of farmers which could have been captured in the sample more than once was not as high as expected.

Comparison

The 156EZ forms for all the farms identified as being within the Gosper County comparison area were gathered with the help of the Gosper County ASCS office during the site visit. There were 80 separate names and addresses collected. One-half, or 40 of these names and addresses were used for the 1991 sample. Names were chosen by selecting every other entry starting at a randomly chosen point on the alphabetized address list.

North Carolina

Population Estimates

Demonstration

The demonstration area includes both the original <u>demonstration area</u> (a relatively small area with roughly 70 farm families) as well as the larger <u>hydrologic unit area</u>.[3]

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[3] In the other 7 sites, we are using all or part of the demonstration areas (DAs). As a completely different part of the President's Water Quality Initiative, there are also so-called

Initially, we did not have a good estimate of the number of operators in the larger area. The hydrologic unit area is almost entirely within Duplin county, (though it overlaps into Sampson and Wayne counties), and is called the Herrings Run Marsh. The demonstration area (DA) is entirely within Duplin county.

Because the project demonstrations were targeted both at local crop farmers <u>and also</u> at local poultry producers, we decided to treat the two groups as separate samples. This produced a total of 4 "demonstration" samples: the demonstration area farmers, the DA poultry producers, the HUA farmers, and the HUA poultry producers.

The local project staff estimated that there are roughly 70 farm families in the demonstration area (DA) and 930 farms in the larger HUA (excluding the DA). We utilized the HUA farmer population estimate as the basis for sampling that group. Because of the small geographic size of the DA, however, we determined that we would be forced to treat the entire population as the overall sample size. Moreover, since we had access to ASCS aerial photographs for the area, we decided to identify the names and addresses of farm operators for <u>all</u> ASCS tracts in the demonstration area. **This process yielded a total of 63 unique names and addresses, which we treated as the population for the purposes of sampling.**

In both the DA and HUA areas, we utilized lists of the "complete populations" of poultry producers that were provided by the local poultry extension office as a basis for sampling. These local staff identified 6 different poultry producers in the DA, and an additional 35 unique poultry producers in the HUA.

Comparison

The comparison area is a small section of Sampson county roughly the same size as the demonstration part of the treatment area. The local project staff provided us with a preliminary estimate of 90-120 farmers in the comparison area. Using a technique similar to that used in the North Carolina demonstration area above, we utilized ASCS aerial photographs and tract/farm records to identify the entire farmer population in the comparison area. **This procedure yielded a total of 70 unique farmer names and addresses. This number was used as the actual**

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hydrologic unit areas (HUAs) created for water quality programs (the main difference between HUAs and DAs is that the HUAs do <u>not</u> have demonstration farms). However, in NC are there coexisting demonstration areas and hydrologic unit areas. We have decided to survey farmers within both the DA and the larger HUA in North Carolina.

population estimate in sampling procedures.

In addition, the local extension office provided us with a list of 6 unique names and addresses of poultry producers in the comparison area. These 6 names and addresses were used as the actual population estimate for the purpose of sampling.

Sample Size and Sampling Procedures

Sample Size in the Demonstration, Comparison, and Poultry Production Areas

In the case of the demonstration and comparison area farmers, as well as all three groups of poultry producers, the populations were sufficiently small to treat as the sampling frame for the surveys. Due to oversight error on the part of the University of Wisconsin team members, Wave 1 surveys were sent to the entire samples of these five groups this last winter (instead of 50% of the sample, as we had intended). This will necessitate more intensive repeat sampling in later waves than we had originally planned, but will also increase the number of data points and reduce sampling error to some degree.

HUA Farmer Sample Size

In the case of the HUA farmer groups, however, a more elaborate procedure was utilized. Assuming a population of 930, se(p) = 0.03, and 75% response rate, the overall sample for the Goshen Swamp HUA area included approximately 286 producers.

HUA Sample Selection

The Goshen Swamp HUA, exclusive of the Herrings Run Demonstration area, was used as the spatial sampling area. The spatial sampling grid was drawn on NHAP 1981 and 1982 aerial photos. The HUA lies approximately 74% within Duplin County, 20% within Sampson, and 6% within Wayne County. An area-weighted farms/farmer was calculated:

Duplin	Sampson	Wayne
(.74 area X 1.20 f/f) +	(.20 area X 1.19 f/f) +	(.06 area X 1.23 f/f)

yielding 1.2 farms/farmer for the HUA.

The overall desired sample size was 286 producers. The procedure to derive potential sample cells over 286 was

(1.2 farms/farmer x 286 producers) - 286 = 57 potential sample cells to add. As a unit of land, the HUA comprises only about 18% of the land area in the three counties. However, (57 potential cells x .18 chance in HUA) yields only 10 additional cells. This implies that there is only an 18% chance that an HUA producer's second parcel of land is within the HUA. It assumes that the second parcel could be anywhere in the three counties, that it has the same probability of being in a far-flung corner of the very large three county land mass as it does of being located within the HUA. It seemed more reasonable that any additional farm parcel of a producer would be closer. For this reason, the area proportion guide was enlarged to (57 potential cells x .50 chance in HUA) = 29 additional cells were added to yield 286 + 29 = 315 sample cells based on redundancy.

The linear nature of the woodland and marshland made it difficult to accurately measure the size of these area and reduce the square mile estimate for the agricultural areas of the HUA accordingly. A rough estimate was that 20% of the HUA was in these non agricultural land covers. Because of the likelihood of capturing woodland, marshland, and non farm parcels in the spatial sampling, the number of sample cells was increased by 20%.

Farms/Farmer	Woods Factor	Overall Sample Size	Approx # of Cells	1991 Fields	Operator 1991 Names
1.2	1.2	286	365-380 -->	186 -->	118

The number of sample cells was therefore approximately (315 cells x 1.2 woods and marsh) = 378 sample cells.

Fields in approximately one-half of the HUA sample cells were used for the 1991 sample, with 186 crop fields highlighted for inclusion. These 186 fields yielded 118 separate producer names and addresses. The 156EZ forms for the farms containing the chosen fields were obtained during the site visit and through mail communication with the appropriate county ASCS offices.

The goal of the 1991 sampling process was to provide 50% of the overall sample number of producers in the HUA.

(.50) (286 producers) = 143 separate names and addresses.

Desired # 1991 Names	Sampling Yield 1991 Names	% Difference
143	118	-17.5%

The sampling process yielded 118 names and addresses of HUA producers, or 41% of the overall sample number of 286 producers.

It appears that a significant portion of the farms in the HUA (at least 42 in our sample), were ASCS inactive with no effective cropland. The population estimate we used for the HUA likely included a good number of non working farms.

Texas

Demonstration

The demonstration area is comprised of the Seco Creek watershed, which covers a large area in Medina, Uvalde, and Bandera counties. The watershed is roughly 170,670 acres in size, with almost 90 percent of the land area being in rangeland. The original project proposal submitted by local staff suggested that there are roughly 300 farm and ranch units in the "study area". Although we initially intended to sample farmers and ranchers separately, it became clear that ASCS maps and records would not allow us to distinguish between the two groups. Moreover, ranchers have cropland in many cases. As a result, we decided to treat the agricultural population as one group for the purposes of the survey.

Because we were unable to receive ASCS aerial photographs for the Texas site from the Salt Lake City, Utah mapping office in a timely fashion, we were forced to make local visits to each of the county ASCS offices in the demonstration area with only USGS topographic maps as a guide. During our local visits, however, we were able to compare our USGS maps with local aerial photographs and construct a complete list of the tracts that were included inside the demonstration watershed. We then obtained the names and addresses of the operators of those tracts.

The full list in the demonstration area consisted of 302 tracts. When we eliminated duplications or redundancies, we had a list of 239 unique farm or ranch operators that represented the entire population in the demonstration watershed.

Comparison

The comparison area is a similar watershed, the Frio River drainage, situated to the west of the Seco Creek site. The number of farms and ranches in this area was determined using similar procedures (we used USGS maps and ASCS aerial photographs and records to construct a list of 433 tracts in the comparison watershed. This list yielded a total of 343 unique farm or ranch operator names, which we treated as the total relevant population in the comparison area.

Sample Size and Sampling Procedures

Based on our population estimates (the complete lists mentioned above), we needed overall samples in the demonstration and comparison areas equal to 198 and 205 farm/ranch operators respectively. Rather than performing a true random sampling procedure, however, we utilized a systematic (essentially random) sampling technique to select names for the first wave of the survey (1992-92). In the demonstration area, the 'calculated' sample size was 99 (one-half of 198); by taking two of every five names on the population list -- the initial pattern XOXOO was created randomly and repeated throughout the list -- we identified a total of 96 farms to include in the first wave of the survey. In the comparison area, the calculated sample for wave 1 was approximately 103 operators (one half of 205); by taking every third name from the population list, using a randomly selected starting point, we came up with a list of 114 names and addresses of farmers and ranchers for the wave 1 survey. These sample sizes are quite close to that required to keep sampling error constant.

Wisconsin

Population Estimates

Demonstration

The East River Water Quality Demonstration lies with the East River watershed in northeastern Wisconsin. Demonstration project staff had constructed a list of roughly 1300 names which we adjusted downward to an estimated 845 because of the farmers located outside the watershed.

Comparison

There are two comparison areas for the demonstration. One is a state-level priority watershed, the East Winnebago watershed. The second comparison is the Bear Creek watershed in Outagamie County which currently has no state or federal water quality program. Using project information, we calculated that there are approximately 330 farm operators in the East Winnebago watershed.

We initially estimated that there were 115 farms in the Bear Creek watershed. For such a small population, we determined that the sample size needed essentially equaled the population. During our ASCS site visit, the aerial photographs revealed that there were actually 325 farms in the watershed. We treated this number of farms as the population for the purposes of sampling.

Sample Size

Demonstration

With approximately 845 farmers in the population for the East River watershed, sampling error at se(p) = 0.03 and a response rate of 75%, we determined that an overall sample of 280 farmers would be adequate.

Comparison

With a population of approximately 330 farm operators, sampling error at se(p) = 0.03, and response rate 75%, a sample of 202 farmers would suffice for the East Winnebago comparison area. Assuming a population of 325, se(p) = 0.03, and a response rate of 75%, approximately 200 farmers were included in the sample for the Bear Creek comparison area.

Sample Selection

Demonstration

The area of the East River watershed was used as a spatial sampling area for the demonstration project. The spatial sampling grid was drawn on a 1986 NHAP aerial photo base.

Farms per farmer were approximately 1.4. The overall desired sample size was 280 farm operators. Derivation of potential sample cells to add was
(1.4 farms/farmer X 280 operators) - 280 = 112 potential sample cells to add. Approximately 60% of the farmland area in Brown County is in the East River watershed. Therefore,
(.60 area) X (112 potential new cells) = 67 new cells were added over the 280 sample size. The resulting number of sample cells was approximately (280 sample size + 67 new cells) = 347 sample cells.

Farms/Farmer	Area Proportion	Overall Sample Size		Approx # of Cells		1991 Fields		Operator 1991 Names
1.4	.60	280	=	345-360	-->	175	-->	128

Fields in approximately one-half of the sample cells were used in the 1991 sample. Therefore, roughly 175 fields were highlighted for inclusion in the 1991 sample. These 175 fields yielded 128 separate operator names and addresses. The 156EZ forms for the farms containing the sampled fields were obtained with the assistance of the Brown County ASCS office during the site visit.

The goal of the 1991 sampling in the East River demonstration area was to provide 50% of the overall sample number of operators.

(.50) (280 farm operators) = 140 separate names and addresses.

Desired # 1991 Names	Sampling Yield 1991 Names	% Difference
140	128	-8.6%

The sampling process yielded 128 names and addresses of demonstration area farmers, or 46% of the overall sample number of 280 farmers. The slightly lower than expected outcome may reflect that the farmer population estimate was a little low.

Comparison

The sample selection process was carried out in a similar manner in the East Winnebago comparison area using a 1987 NHAP aerial photo sampling base. The 148 fields highlighted for the 1991 sample yielded 126 separate farm operator names and addresses.

The goal of the 1991 sampling in the East Winnebago comparison area was to provide 50% of the overall sample number of operators.

(.50) (202 farm operators) = 101 separate names and addresses.

Desired # 1991 Names	Sampling Yield 1991 Names	% Difference
101	126	+24.8%

The sampling procedure yielded 126 names and addresses of East Winnebago comparison area farmers, or 62% of the overall sample number of 202 farmers.

ASCS farm tracts were drawn onto the aerial photos for the Bear Creek watershed during the site visit to the Outagamie County ASCS office. The 156EZ forms for the farms containing all the tracts in the watershed were then generated and brought back to UW-Madison. The spatial sampling grid was drawn on top of these farm tracts which were labeled with ASCS tract numbers. The spatial sampling process was then carried out to yield 128 fields for the 1991 sample. The 156EZ forms for the farms containing the tracts with the sampled fields were pulled to comprise the list of 98 names and addresses for the 1991 sample.

The goal of the 1991 sampling in the Bear Creek comparison area was to provide 50% of the overall sample number of operators.

(.50) (200 farm operators) = 100 separate names and addresses.

Desired # 1991 Names	Sampling Yield 1991 Names	% Difference
100	98	-2.0%

The sampling process yielded 98 names and addresses of Bear Creek watershed farmers, or 49% of the 200 farm operators.

D. QUESTIONNAIRE DESIGN

The design of a mail questionnaire is a critical issue relative to the validity of responses, the response rate, and the overall credibility of the project. The construction involves a number of technical issues such as the use of heavy stock paper, "white-space," question-flow, use of graphics, multiple colors and lay-person language among others. Although the research is not clear on this issue, the experience of the Wisconsin team is that these issues are more important than the overall length of the instrument.

Concerns had been expressed by local and state project reviewers of draft instruments about some "personal" questions. These were questions that asked about farm finances, education, or family labor. Here the Wisconsin team attempted to craft a delicate balance between what was specified in the USDA-UW contract, validated techniques reported in the research literature, and the concerns of local project personnel.

1. UW Technical Review Group

An essential element in the design of the questionnaire was the role played by the UW Technical Review Group. The individuals and disciplines comprising this group are as follows:

Larry Bundy, Soil Science
Jeffrey Wyman, Entomology
Gary Bubenzer, Agricultural Engineering
Jess Gilbert, Rural Sociology
Lin Compton, Continuing and Adult Vocational Education
Fred Madison, Soil Science and the Wisconsin Geologic Natural History Survey
Richard Klemme, Agriculture Economics
Jerry Griswold, USDA Soil Conservation Service

These individuals played an important role in the BMP selection process and in reviewing the technical accuracy of draft questionnaires. They were often supplied technical bulletins and materials gathered from the respective demonstration sites in order evaluate the accuracy of specific questions. They also assisted in determining what had to be measured if certain behaviors (e.g., extent of adoption of a BMP) were to be deduced from the answers.

2. USDA/WQ Best Management Practice Selection Process

Introduction

Given the extremely large and varied number of best management practices (BMPs) that could potentially be promoted at each of the eight USDA water quality demonstration sites, we were forced to develop a strategy for reducing the number of BMPs we would consider in our national Producer Adoption Study. Our selection strategy was driven by three main concerns: (1) **to ensure our ability to make national comparisons across sites** (either by selecting the same BMP at each site or finding BMPs that are similar on certain dimensions); (2) **to ensure that BMPs that we study will be actively promoted and are relevant at the local level**; and (3) **to determine key characteristics of BMPs that may explain patterns of adoption (or non-adoption).**

Methods

Identifying Dimensions of BMPs

In order to facilitate comparisons, we selected four dimensions of the water quality BMPs for intensive study. These included capital, labor, and managerial requirements, as well as the divisibility potential for each BMP. In order to rank the more than 100 practices that were to be used in the USDA/WQD sites, we decided to obtain the expert opinions of field personnel knowledgeable about the practices. To do this, several copies of a detailed BMP classification form were sent to USDA line agency personnel in Washington, and to the SCS and Extension state coordinators in each state. Respondents were instructed to rank their state's BMPs along the four specified dimensions. BMPs were ranked on a 0-10 scale, where 10 indicated a "high" value relative to the other BMPs on the list. The respondents were provided with guidelines for classifying the BMPs as follows:

Capital Requirements

"Capital expenditures typically required to install and use the practice; include expenditures on capital goods, custom labor, hired management services, etc."

This category included all types of capital expenditures typically associated with the use of the particular BMP. Although this may vary for individual farms, we were interested in the typical experience. We asked respondents to include: (a) expenditures on capital equipment (structures, machinery); (b) expenditures on short-term hired labor (i.e. construction or one-time custom work); (c) expenditures on hired consulting or technical services; and (d) other kinds of capital expenditures (e.g. information technologies).

Labor Requirements

"Relative increase in labor from existing sources typically required to use the practice."

The key focus was to measure the increased labor that must be spent on farm work in general. We did not intend to include labor that is spent on short-term construction of the BMP. Similarly, we did not want respondents to include labor that is typically hired from outside (like construction labor), or that the farm household could not provide themselves were they to want to do so (i.e. specialized consulting services). We wanted to direct attention toward the kinds of regular, long-run labor requirements (usually met by existing farm labor sources) associated with the normal use of the BMP. Of course, some farmers may choose to meet these long-term labor needs by hiring farm workers, while others may use their own labor, but in either case this was be considered an increase in labor requirements.

Managerial Requirements

"Sophistication and timing of decisions made by the farmer associated with installing and using practice; required training or experience."

The key idea was to identify the relative skill or managerial requirements that the BMP requires **of the farm operator** in order to successfully use the BMP. We did not intend to include the use of complex services that are virtually always purchased from off-farm specialists (i.e. soil tests; sophisticated IPM consulting services, etc.).

Divisibility

"Extent the practice can be used on a small scale or limited basis with opportunity for experimentation without irreversible commitment."

The key idea was to distinguish between BMPs that are all-or-nothing propositions and those that are easier to experiment with on a small scale. Divisibility may involve the ability to try the practice on a small part of the farm, or equivalently, the ability to divide any necessary capital expenditures required for successful use of the BMP.

In many cases, National and State coordinators gave extra copies of the BMP Classification Form to knowledgeable staff persons in their offices. Ultimately, we received 90 completed forms the various states as shown in Figure 4.4:

Figure 4.4

Responses to the BMP Classification Form

State	Total
California	3
Florida	7
Maryland	12
Minnesota	20
Nebraska	11
North Carolina	14
Texas	1
Wisconsin	6
USDA/Washington	14
TOTAL:	90

BMP Cluster Identification

The results of the BMP Classification forms were entered into a database, that was then used to identify which BMPs were most similar along all of these dimensions. This was achieved using a technique called cluster analysis, which groups multiple items simultaneously across numerous variables[4]. Cluster analysis

[4] In particular, we used the cluster subroutine on SPSS using the standard euclidean distance measure and the between group average clustering method.

progressively groups items by agglomerating individuals (or groups) that are most alike; the process begins with each item in a separate group and continues until all BMPs are in the same group. For the present analysis, a 30-group solution was selected to balance the need to have items within each group that were very similar, yet a small enough number of groups overall to be manageable.

Of the 30 clusters created, seven had more then 5 BMPs within the group. We carefully examined the BMPs in each of these 7 clusters, and selected the four most distinct and promising clusters for use in our national study. These four clusters were selected because they: (a) had representation in all (or virtually all) of the 8 states; (b) were substantially different from one another; and (c) were intuitively satisfactory.

The four clusters that were selected for the national Producer Adoption Survey are listed in Figure 4.5:

Figure 4.5

BMP Clusters Selected For Producer Adoption Survey

GROUP A: BMPs that have Low Capital Requirements, High Managerial Requirements, and a High Potential for Divisibility.

1. Improved Pesticide Rates
2. Improved Pesticide Application Methods
3. Improved Pesticide Selection
4. Improved Pesticide Equipment Calibration
5. Nutrient Budgeting: Legume/Manure Credits
6. Nutrient Budgeting: Use of Soil or Plant Tests
7. IPM: Use of Economic Thresholds

GROUP B: BMPs that have High Capital Requirements, and a Low Potential for Divisibility.

1. Lagoon Upgrade
2. Manure Holding/Storage Facilities
3. Milk House Waste Management
4. Pesticide Storage Facility
5. Improved Pesticide Handling/Loading Site
6. Improved Septic Systems

GROUP C: BMPs that have Low Managerial Requirements.

1. Improved Animal Feeding/Watering Sites
2. Riparian Access Barriers/Streambank Fencing
3. Grassed Waterways
4. Pasture Improvement: Fencing
5. Wellhead Protection and Maintenance
6. Tailwater Wetlands Flow
7. Backsiphoning Protection

GROUP D: BMPs that have High Labor Requirements, High Managerial Requirements, and a High Potential for Divisibility.

1. Effective Irrigation Scheduling
2. Irrigation Management: Soil Moisture Testing
3. Split Applications of Nutrients
4. Integrated Pest Management: Pest Scouting
5. IPM: Monitoring for Pests
6. Non-Pesticide Alternatives: Use of Cultivation Systems

BMP Ranking By Local Importance

The results of the cluster analysis sent to each state for confirmation and evaluation. In particular, we were interested in identifying the extent to which each of these BMPs were to be central to the demonstrations planned in each state. To ensure that we selected practices for study that would be promoted in a serious way, we sent a BMP Ranking Worksheet to the state SCS and ES coordinators at each demonstration site, asking them to rank the BMPs within each cluster as either: (a) "will <u>not</u> be included in our project"; (b) "will receive <u>some attention</u> in our project"; or (c) "will be of <u>central focus</u> in our demonstration site". The results of this brief survey were used to identify the mix of practices that would best facilitate national comparisons while maintaining relevance to local conditions.

Once we had selected the tentative BMPs to use in our national survey (a subset of the BMPs listed in the four clusters), we again sent the list of proposed study BMPs to state-level project staff for final validation. At the same time, if there were BMPs that would play a major role in their respective demonstration efforts, which were also <u>not</u> selected for our national comparisons, then the local staff were instructed to select **one additional local BMP** to include in our survey instrument.

Finally, in consultation with the local project staffs, we attempted to reduce the overall list to no more than 4 BMPs **<u>per production system</u>** at each site. We attempted to keep only those BMPs that were most central to local project goals.

Final Results

The final results of the BMP selection process are presented in Table 4.2 below. For a variety of reasons, many of the practices that were included in the cluster analysis procedure were not chosen as important in the final stage by local staff. This is the result of continually shifting local project priorities and inaccurate information included in the individual local project proposals. As Table 4.2 indicates, there were no practices included in the final 1991-92 surveys that were identified as members of Group B, and only one practice in one state that qualified as Group C.

It should be noted that it may be possible to classify some of the locally identified BMPs according to the criteria discussed above. If this were done, we could then reconstruct the clusters for comparison, including only the BMPs which were eventually included in the surveys.

Table 4.2

LISTING OF SELECTED BMPS BY STATES

BMP GROUPS	CA	FL	MD	MN	NC	NE	TX	WI
	STATES							
GROUP A: Low Capital, High Management, and High Potential Divisibility.								
1. Nutrient Budgeting: Manure Credits			X	X	x[6]			X
2. Nutrient Budgeting: Legume Crediting				X	X		X	
X								
3. Nutrient Budgeting: Use of Soil or Plant Tests		X[1]				LS[5]	X	
GROUP B: High Capital Requirements, and Low Potential for Divisibility.								
(None selected in final survey drafts)								
GROUP C: Low Managerial Requirements								
1. Riparian Access Management							X	
GROUP D: High Labor and Management, High Potential Divisibility.								
1. Split Application of Nutrients		X[2]	X	X	x[5]	X	X	X
2. Soil Moisture Testing/Watertable Monitoring		LS[3]						
3. Irrigation Scheduling		LS[3]		LS		LS		
4. Testing for Irrigation System Uniformity/Efficiency		LS[2]						
GROUP E: Local BMPs								
1. Tailwater Recirculation Systems	LS							
2. Gravity Tailwater Recapture System	LS							
3. Static Irrigation System	LS							
4. Float Valve Rice Boxes	LS							
5. Use of Fully Enclosed Seep-Irrigation System		LS[1]						
6. Poultry Composting					LS[4]			
7. Brush Management -- Prescribed Burning							LS	
8. Brush Management -- Mechanical Brush Control							LS	
9. Brush Management -- Reduced Herbicide Usage						LS		
10. Farmstead Assessment System								LS

KEY:

- X = chosen by us; central to project
- x = chosen by us; will receive some attention by project (not central)
- LS = Locally-selected BMP that we will use
- 1 = vegetable producers only
- 2 = citrus growers only
- 3 = both citrus and vegetable producers
- 4 = poultry producers only
- 5 = farmers only
- 6 = both poultry producers and farmers
- 7 = deep soil nitrate testing only

E. SURVEY IMPLEMENTATION

A number of options were available for collecting the needed information as part of the survey process. However, due to the assumptions on needed response rates used for calculating sample error and sizes, it was determined that a rigorous procedure was needed. The Wisconsin team decided to use a version of the "Dillman Technique" or Total Design Method" (Dillman, 1978). The premise of this technique is that "to maximize both the quantity and quality of responses, attention must be given to every detail that might affect response behavior. The Total Design Method relies on a theoretically based view of why people do and do not respond to questionnaires and a well-confirmed belief that attention to administrative details is essential to conducting successful surveys" (Dillman, 1978:viii).

1. Desktop Publishing Procedures

The use of a desktop publishing program in developing the questionnaire provided an advantage that many other mail surveys do not utilize. The strategy, as advocated by Dillman (1983), was to create an eye-appealing layout that would improve readability for the farmer. Graphics were developed to aid farmers in following the skip patterns and make the questions visually more attractive.

Working drafts of each site-specific questionnaire were imported from WordPerfect into Aldus PageMaker in May 1991. To assure quality control for uniformity, a master template was designed using Maryland as the prototype. Again, following Dillman's Total Design Method, questions were ordered such that the opening questions were water quality-related and assumed interesting to all types of farmers. They were followed by questions about communication related to water quality. This first section was under the heading "Where do you get information?" The second section labeled "What about your farming practices?" contained more specific questions about current practices and BMPs. Finally, in the socioeconomic section sporting the heading "What about yourself?", the most sensitive questions about total acres and gross income were included. Additionally, transitional statements were included when we moved from communication to BMP sections and BMP to socio-economic sections to provide clues about the upcoming topics and preface the next set of questions.

Site-specific questions that were not covered in the prototype (e.g., irrigation) were added to the end of similar questions to keep the logic and reasoning constant throughout the questionnaire. In some site-specific versions (i.e., California and Florida), none of the exact items were used from the

prototype; however, the style and layout were followed.

Several content revisions were made to the site-specific questionnaires once they were in desktop format. One such revision included comments on the content, as well as design, from each of the state offices. Further, minor revisions were made after pretesting the questionnaire (as described in this report under pretesting and validation).

In November and December 1991, we completed desktop publishing of the questionnaire. Overall, 10 site-specific versions of the questionnaire representing eight states were created. In six of the eight states we were able to use one questionnaire, however, in Florida and North Carolina two different types of farmers were being targeted in the demonstration area (poultry and crop producers in North Carolina and vegetable and citrus producers in Florida). Because the farmers and their practices were so different, we opted to create two versions of the questionnaire for each state. While a tailor-made instrument for the respondents in specific locations was the optimum choice, this additional split heightened the need for attention to uniformity and detail. The length of the site-specific versions ranged from 12 to 16 pages, with the average length being 12 pages.

Approximately a week after the land user received the advance letter, the questionnaire was delivered by first class mail. The envelope had a mailing label where the respondent's name and address were printed in large letters. The questionnaire was packaged in a large, white envelope that had a large, cellophane window so that the three-color map of the local area was exposed. The envelope also used a number of large, colorful, commemorative first-class stamps to clearly distinguish it from other bulk or third-class mail. Inside the outside envelope was the questionnaire, a cover letter, and an addressed, stamped return envelope. Again, the return envelope used large, colorful, commemorative first-class stamps. The cover letter explained the role of the Wisconsin team, emphasized the salience of the issue along with the importance of their response, and gave a number and address if there were any questions or concerns. Each cover letter was individually signed by the principal investigators for the project.

Approximately two weeks after the questionnaire was mailed, a reminder letter was mailed to those respondents who had not returned the questionnaire up to that time. This was a personally-addressed, hand-signed letter that encouraged respondents to mail in the questionnaire if they had not already done so. It also repeated the salience of the issue and the importance of their cooperation.

Two weeks after the first reminder letter had been mailed, a second survey was sent to all current nonrespondents. The packet was identical to the first questionnaire mailing except that the cover letter mentioned that they still had not returned the earlier survey.

The final mailing was scheduled for approximately two weeks after the second questionnaire was mailed. This was a final reminder letter containing most of the themes expressed in earlier communications.

2. Mail Questionnaire Design

A successful mail questionnaire involves a sequence of coordinated contacts with the selected land users. To facilitate this process a special set of USDA Water Quality Project stationery was created. The stationary contained a map of the United States with a large water drop superimposed on it. Surrounding this map was the logo of "Farmers and Water Quality -- Local Answers to Local Issues." The return address listed the College of Agriculture at the University of Wisconsin-Madison. This special stationery was used in demonstrations that either did not have or did not wish to use special demonstration project stationery. It was also used in many of the comparison areas where local demonstration project stationery would be inappropriate.

Local project managers had the option of either using their stationery, which they would provide to the Wisconsin team, or using the USDA Water Quality Project stationery. This stationery was used in an advance letter notifying selected land users that they would be receiving a survey in the next few days. The advance letter used "mail-merge" procedures so that surnames and appropriate titles were employed. This advance letter was signed by local and/or state project personnel. The letter also encouraged land users to cooperate with this national evaluation being managed by the University of Wisconsin. Another important theme in this letter was the salience of the issue being investigated.

3. Local Coordination and Cooperation

The above mail questionnaire procedure required a significant level of local cooperation. Coordination was also involved. Local staff had to be kept informed of just where the Wisconsin team was in the above mail questionnaire procedure. Local and sometimes state staff had to personally sign up to hundreds of advance letters. They also had to respond to phone calls, office visits and other queries about the nature and legitimacy of the questionnaire local residents received in the mail. Local staff

also received many phone calls from Wisconsin team staff concerning address mix-ups, respondents who no longer operated the selected point of land, and a number of other issues. These local and state staff need to receive credit for the important role they played in increasing response rates.

4. Pretesting and Validation

In October 1991, the UW research team completed designing survey questions for each of the states and their demonstration/ comparison sites. Cover designs/maps were put together for each of the survey versions, and the surveys were published using a Pagemaker desktop publishing program.

In order to assure that both the questions and the survey lay-out were "user-friendly" and understandable to producers, it was decided to pre-test the survey in areas outside or adjacent to the demonstration and comparison areas selected for study. Members of the UW research team contacted local Extension and/or SCS personnel in each of the study areas to identify ten producers in outlying areas who they thought would be willing to serve as respondents. In addition, local personnel were asked to recommend a person who would be responsible for contacting selected producers:

a. to encourage them to fill out the survey in the event they did not return it afer two weeks; and

b. to discuss with producers their opinions about the pre-test instrument and determine if there were any particular questions that were confusing or difficult to answer.

In some states, we hired people in the area to conduct telephone interviews with producers. In two states, local project staff volunteered to help us in this regard.

The pre-test instruments were mailed to 80 identified producers in November 1991. Copies were also mailed to project staff, so that they could see what producers were receiving. Producers returned most surveys in November and December 1991. Response rates were generally high, with 63 completed surveys returned out of the 80 distributed.

Along with a copy of the survey, a follow-up questionnaire (see Appendix C.1) was distributed to all pre-test interviewers. This questionnaire asked -- among other things --

* how long it took the producer to fill out the survey;

* if there were any problems with the directions for

answering questions;

* if there were questions that weren't relevant to their operation;

* and if there were any questions that were especially hard to answer.

Overall, these interviews yielded that the range of time it took respondents to answer the survey was highly variable, from 15 minutes to two hours, and the typical amount of time being approximately three-quarters of an hour to an hour. Less than five percent of the producers surveyed had any problems with the directions for answering the questions or recalled questions that were especially difficult. Some producers disliked the income question; however, those that did usually skipped it. In some cases, if producers had comments about question phrasing, or wanted to elaborate their answers, they marked their comments in the survey booklet.

Once the surveys were received in the UW offices, team members reviewed the questionnaires. Any questions that had recieved comments from respondents or interviewers were reviewed and edited, if necessary. Skip patterns in the survey were likewise reviewed to assure that respondents had negotiated these without difficulty. Altogether, wording changes were negligible, with only a couple of instances of editing necessary, usually relating to the proper identification of area institutions/organizations. One question was dropped from one of the survey versions because it was judged irrelevant to the producer population's type of farm operation.

5. Mailing and Tracking Procedures

Prior to beginning survey distribution, it was necessary to establish a logistical/tracking system to handle the following functions:

1. to assure that each respondent received the appropriate correspondence and survey mailings;

2. to assure that respondents did not receive second surveys or other correspondence after returning surveys to the UW offices;

3. to record changed addresses and notes appropriate for unique respondent situations; and

4. to keep track of surveys upon arrival in the UW offices -- whether the surveys had been filed, were being data entered, verified, etc...

This tracking system was set up on a spread sheet program called EXCEL 4.0 for Windows 3.1. The EXCEL spreadsheet system provided the database for all survey mailings.

Setting Up Tracking System/EXCEL Files

Approximately 1,800 farm/ranch sites were selected by the spatial systematic stratified random sampling technique discussed previously. Members of the UW research team went on site visits to ASCS offices in each of the eight states to get address information for the selected sites off of 156EZ forms. The address information was entered at the UW offices into the EXCEL files.

The EXCEL files were set up according to state; demonstration, comparison or watershed area; and type of operation (e.g., citrus, vegetable, or poultry). In total 26 files were created. Figure A, below, outlines these files.

FIGURE A
Sampling Sites -- Description

State	Description
CA1	California Demonstration Project, Colusa County
FL1	Florida Demonstration Project, Citrus Growers, Lake Manatee Watershed only
FL2	Florida Demonstration Project, Vegetable Growers, Lake Manatee Watershed only
FL3	Florida Demonstration Project, Citrus Growers, Manatee County (not Lake Manatee Watershed)
FL4	Florida Demonstration Project, Vegetable Growers, Manatee County (not Lake Manatee Watershed)
FL5	Florida Comparison Site, Citrus Growers, Palm Beach County
FL6	Florida Comparison Site, Vegetable Growers, Palm Beach County
MD1	Maryland Demonstration Project, Frederick County
MD2	Maryland Comparison Site, Frederick County
MN1	Minnesota Demonstration Project, Isanti County
MN2	Minnesota Demonstration Project, Sherburne County
MN3	Minnesota Comparison Site, Wadena County
NC1	North Carolina Demonstration Project, Farmers
NC2	North Carolina Demonstration Project, Poultry Producers
NC3	North Carolina HUA Site, Farmers
NC4	North Carolina HUA Site, Poultry Producers
NC5	North Carolina Comparison Site, Farmers
NC6	North Carolina Comparison Site, Poultry Producers
NE1	Nebraska Demonstration Project, Adams County
NE2	Nebraska Demonstration Project, York County
NE3	Nebraska Comparison Site, Gosper County
TX1	Texas Demonstration Project, Seco Creek Watershed
TX2	Texas Comparison Site, Frio River Watershed
WI1	Wisconsin Demonstration Project, East River Watershed
WI2	Wisconsin Comparison Site, East Winnebago County
WI3	Wisconsin Comparison Site, Bear Creek

In addition to address information, mailing dates and survey return date information, field and tract information for each respondent was also entered into the EXCEL files. (Attached for the reader's information is a sample spreadsheet which includes all EXCEL column headings. See Appendix C.2.)

Identification Numbers

For tracking purposes, a six-digit identification (ID) number was created for each respondent. This number reflects the respondent's location/type of operation (whether in the demonstration, comparison, watershed or HUA area, or whether a poultry producer or other type of farmer), as well as the survey wave number, the year of the survey, and the individual's personal three-digit identifier. Once assigned, this ID number permanently represents an individual across the life of the survey. New ID numbers are generated only for individuals as they are sampled and brought into the project in successive waves.

Bad Address and Other Contingencies

To account for bad addresses, lease arrangements, and a host of other contingencies, a coding system for returned surveys was developed to indicate in the EXCEL spreadsheets the following:

1.whether respondents returned blank or non-usable surveys to the UW offices, or

if the respondents

2. no longer own or operate a farm;

3. rent the farm to someone else (in such cases, we ask for the address of the lessor -- see front page of survey, inside cover);

4. owns but does not farm his/her land;

5. is deceased;

6. address is incorrect/undeliverable;

7. or if the respondent refuses to cooperate.

In those cases where it was possible, we attempted to track down bad addresses and/or new owners/operators.

Mailing Strategy

Our approach to distributing survey and reminder mailings was modelled after the Total Design method outlined by Dillman (1991). Dillman recommended disseminating four personalized mailings to respondents. We expanded this to five mailings, including:

1. an advance letter signed by local or state level project representatives in each of the eight states;

2. a cover letter and survey;

3. a reminder letter;

4. a second cover letter and survey; and

5. a final reminder letter to remaining nonrespondents.

Scheduling of Mailings

Seasonal activities of farmers/ranchers in the various states, as well as workload capacity of the project team, were taken into account in scheduling the mailings. Correspondence to farmers was staggered through the months of December, 1991, January, February, March, and early April 1992. In total, five mass mailings (covering the five types of correspondence outlined above) were mailed out for each of the 26 groups of farmers listed in Table A. Thus, 130 mass mailings were sent out over a 3-4 month period. In addition, smaller mailings were interspersed into the project schedule as new addresses were received or as local project managers provided information about respondent survey needs.

Inaccurate Address Information

In situations where the address information provided to us was clearly inaccurate and needed to be updated, efforts were made to work with local project people to rectify problems. This sometimes involved delays in initiating the mailings, or required regeneration of mailings. For example, in one situation (which unfortunately became apparent only after the surveys were distributed), the address information included in the ASCS 156EZ forms had become outdated. To deal with this problem, maps with tract information had to be sent to state personnel, who worked with local personnel to identify current owners/operators. This involved several additional hours of map generation and communication work.

Initial Mailings

As outlined above, the first mailing to all respondents was the advance letter. The purpose of the advance letter, addressed to each individual respondent and signed by a locally known representative, was two-fold:

1. to inform respondents that they were selected to participate in a research project about water quality protection and related farm management practices; and

2. to encourage respondents to voluntarily participate and assist locally administered efforts within the community. (A sample Advance Letter is included in Appendix C.3.)

Advance letters and labels were generated using the EXCEL spreadsheets. Sorts for the relevant address information were performed in EXCEL, and this information was then converted to WordPerfect 5.1 compatible format. The letters were printed on stationery provided by the eight local or state offices. Envelopes were posted and labeled with respondent names/addresses; individual letters were paper-clipped to their respective envelopes to assure that all mailings remained in order. Letters were then mailed to local and/or state project administrators for signing and mailing to prospective respondents.

The week following distribution of advance letters to the farmers, cover letters -- to accompany surveys -- were likewise generated off the EXCEL spreadsheets, signed with the principal investigators' signatures, and then combined with surveys that had all been numbered with respondent ID numbers. Respondent ID numbers were also printed on the accompanying return mailing envelopes -- to provide a second check should respondents choose to obliterate the numbers on returned surveys. (A few times respondents either blacked out or cut out the ID number on their surveys. Numbers on return envelopes helped us to identify them.) At all times, as mailings were being prepared, respondents and ID numbers were matched and doublechecked in order to assure that ID numbers consistently matched the person receiving the survey. Postage was fixed on both the outgoing and return envelopes, with rates varying according to survey weight.

One research assistant managed the EXCEL/WordPerfect 5.1 mail-merges and generated the correspondence and identification number lists, and three or more additional employees were required to physically put together the mailings on a timely basis.

Incoming Surveys and Follow-up Mailings to Non-respondents

Returned surveys were date-stamped, marked as "returned" in the EXCEL spreadsheets, and kept secure at the UW Department of Agricultural Journalism offices. Referrals to a new owners/ operators were noted, new ID numbers for these referrals created, and surveys then distributed to these individuals. Notes were kept in the EXCEL files to track referral and other situations.

For follow-up mailings to non-respondents, sorts were performed in each of the 26 EXCEL spreadsheets for operators who had not returned surveys. These sorts typically occurred at weeks 3, 5 and 7, following initial distribution of surveys. At week 3, reminder letters were sent. At week 5, second surveys and cover letters were sent out; and at week 7, final reminder letters were mailed to continuing non-respondents. By sorting for non-respondents only, we avoided sending unnecessary mailings to people who had already returned surveys.

Questionnaires Tracked Through Data-Entry

Once checked in at the Department of Agricultural Journalism, completed surveys were bundled into batches of 20, according to the survey site and producer type (basically according to the 26 respondent groups indicated in Table A). The bundles were then expedited to a data-entry team. Check-out sheets, batch log sheets and files were maintained for all questionnaires. Every effort was made to assure that no surveys were misplaced or lost.

Storage of Questionnaires

For storage purposes, survey files are kept by ID number for each respondent; thus, a file is kept for each respondent across the life of the project. This file will contain all surveys returned by that individual over successive waves, as well as any relevant correspondence generated for that particular individual.

6. Data Entry Procedures

Due to the complexity of the data set in terms of total number of site-specific questions and therefore total number of variables, we chose to utilize a data entry program (SPSS Data Entry) to decrease the chance for error. The program allowed the site-specific questions to be reproduced on the screen with spaces for responses to be entered. With the program, data entry personnel were able to compare the questionnaire on screen with the questionnaire being coded to ensure the correct values were entered in the correct space. Additionally, the program allowed

valid values and their value labels to be displayed continually for easy reference.

The large number of variables (296 to 430) in each site-specific version of the questionnaire dictated that data entry on personal computers be completed in sections. The communication, BMP and socio-economic sections contained a separate data entry form for each site-specific questionnaire. With three data entry forms being created for each of the 10 site-specific versions of the questionnaire, a grand total of 30 data entry forms were created.

Data entry personnel were trained carefully in how to follow skip patterns, the differences between refusal and does not apply responses, valid answers and to notice any unusual answers in the responses. Any discrepancies or unclear answers were put aside for a final determination by the data coordinator and then were entered.

Once a site's data was entered, verification personnel checked the data. In the verification process, each site's data were reentered using the verification function of SPSS Data Entry which compared the value that was first entered by the data entry person with the value the verification person entered. If the values differed, the computer notified the verification person, who would determine which value was correct. A minuscule number of errors occurred thanks to the great accuracy and attention given by the data entry personnel.

After the completion of the verification process, the merge procedure got underway. Again, due to the large number of variables, the only way to have a complete state data set was to load the communication, BMP and socio-economic files to a VAX computer and merge the three section files into one master file. Once each state version was successfully merged, North Carolina poultry and crop producers were joined to make one state data set for North Carolina. A similar processes was undertaken to merge the responses from Florida vegetable growers with citrus producers. Again, the mergers were checked for accuracy. At this point, frequencies were run and the data was cleaned.

7. Non-Respondent Bias Test

The purpose of the non-respondent bias test is to determine if there are differences in measured characteristics between those people who responded to the initial survey mailings and those people who did not.

Selecting Operators to Participate in the Test

Two criteria were applied for determining the number of nonrespondents to be interviewed. The first was to assure that the number was a sizeable enough proportion of the total sample at each site to adequately compare nonrespondents with respondents. In most cases this number approximated ten percent of the sample. The second criterion was a more pragmatic one: to use the nonrespondent interview pool to raise the completed interview percentage to 75 percent in cases where it had fallen short. In total, approximately 200 operators have been selected to be interviewed and surveyed.

Across all samples, the overall number of respondents selected to be interviewed should yield findings sufficient to determine if there is a discernible difference between those people who filled out the survey during the initial survey mailings, and those people who did not. Due to lower response rates in North Carolina, the number of interviews occurring in this state is unusually high -- approximately 75. The number of interviews scheduled in the other states ranges from 11 to 30; the variability in these numbers reflects the types and sizes of producer populations being studied.

Administration of Non-Respondent Bias Test

The non-respondent bias test was initiated in May and is currently in process. Nonrespondents were randomly selected out of the EXCEL database. Phone numbers of these operators were tracked down and combined with operator address information and ID numbers into a master list (arranged by area) for interviewers to use in setting up appointments with non-respondents.

To hire local interviewers, we initially re-contacted interviewers who had assisted with the November/December 1991 pre-test effort to ask if they would be willing to work with us again. In states where the initial interviewers are no longer available, we have contacted local project personnel to recommend other people. At this time, interviewers have been hired in all states. (In Florida, California and North Carolina, we are still in the hiring process.)

To assist the interviewer, a notebook was assembled which outlines: how the interviewer should present the survey effort, the type of correspondence the farmers have received in the past, instructions for submitting an invoice to the UW offices, and whom to contact on the research team with questions or concerns. This notebook also contains the names, addresses and phone numbers of all the nonrespondents identified to participate in the test. In cases where the phone numbers of the operators are not available via directory assistance, this is indicated, and

the interviewer is instructed to do whatever is reasonable to track down the operator and encourage him/her to participate in the interview.

Current Status

At this time, non-respondent interviews have been completed in both the demonstration and comparison areas in Nebraska. Interviews have also been completed in the comparison area of Minnesota, while they are still in process in the demonstration area. Interviews in Maryland, Texas and Wisconsin are also in process. Local staff are currently offering assistance to us in Palm Beach County, Florida (the comparison area), such that it may be unnecessary to hire an interviewer there; however, we still are attempting to hire an interviewer for the demonstration and watershed areas of Manatee County, Florida. Interviewers are being hired in California and North Carolina.

Results

Results of the non-respondent bias test will not be available until late Summer. Of the operators selected, 70 to 75 percent are expected to participate in the interview process; however, accurate bias test response rates are not available at this time.

Upon completion of all interviews and return of all surveys to the UW offices, the surveys will be data-entered and analyzed to determine if there are any differences between the sub-sampled non-respondent populations and the operators who responded directly to the initial survey mailing. It is expected that reasons for non-response may be pin-pointed, such as illiteracy, negative perceptions of the government, and dislike of surveys, to name a few. These are some of the reasons currently being communicated to us by the interviewers in the field; however, it is unclear if these situations affect the <u>responses</u> operators indicate to survey questions. These issues will be addressed upon completion of the bias test.

Should it become apparent that there is <u>no bias</u> (meaning, no difference between non-respondents and initial respondents), then the non-respondent survey data will be merged with the overall dataset. Then overall response rates, incorporating both datasets, will be recalculated to reflect the merged totals.

8. Response Rates

Response rates were calculated at the state level in two ways:

1. according to <u>overall</u> rate of surveys returned, which accounts for the total number of surveys returned per surveys distributed; and

2. according to whether or not the surveys returned were <u>usable</u> for data entry.

To determine the total number of surveys returned and also to account for surveys that were returned blank (and were therefore not usable for data entry), sorts were done through each of the state EXCEL files. In the EXCEL files are recorded survey return dates, comments and reason codes for blank surveys. (See Section 4. E. 4. Mailing and Tracking Procedures for an explanation of the EXCEL tracking system.)

Overall Survey Response Rate Calculation

To calculate the overall survey response rate, it was necessary to determine the total number of surveys returned <u>by respondents</u>. To do this, the total number of returned surveys was adjusted by the number of surveys returned by the postal service for reasons of "insufficient address" or "expired forwarding address." Thus, the surveys returned by the postal service were subtracted from the number of total returned surveys. This number became the <u>numerator</u> of the overall survey response rate formula.

The <u>denominator</u> of the overall survey response rate formula takes into account

1. the total number of operators sampled in Wave 1; and

2. known "duplicates" -- people who were identified as operating two or more selected sites in the sample rather than just one. We were informed about these duplicates by absentee landowners/lessors, or former owners.

To calculate the denominator of the overall formula, the number of duplicates was subtracted from the total number of operators sampled.

The overall survey response rate calculation therefore appears as follows:

$$\frac{\text{Total \# Questionnaires Returned by Respondents}}{\text{Total \# Questionnaires Sent (-) Known "Duplicates"}}$$

Usable Survey Response Rate Calculation

Surveys returned blank or incompletely filled out are obviously not usable for data entry purposes. A coding system was built into EXCEL which documented the reasons for blank surveys. These included:

* No reason, survey returned blank
* Respondent does not own or operate a farm
* Respondent does not operate a farm, and did not provide the name of the new operator
* Respondent is not an operator, but did provide a current operator's name (The referral is noted)
* Respondent owns but does not farm land
* Respondent is deceased
* Address is incorrect/undeliverable
* Address is incorrect, but a new address is provided
* Respondent refused to cooperate

A formula was built to calculate response rates for usable surveys, taking into account the above reason codes.

The numerator of this formula is the total number of surveys returned minus the total number returned blank (whatever the reason).

The denominator of the formula reflects the total number of surveys sent, minus the number of known non-operators (this information is provided by respondents), minus the number of known "duplicates" (identified by the owners/operators who referred us to people we had already sampled). This denominator more accurately reflects the sample population per information we received from respondents.

The usable survey response rate calculation appears as follows:

$$\frac{\text{Total \# Questionnaires Returned (-) Total \# Blank}}{\text{Total \# Questionnaires Sent (-) Nonoperators (-) "Duplicates"}}$$

The following tables outline for each state both overall and usable response rates. The numbers used to calculate these response rates are included for the reader's information.

RESPONSE RATES
as of June 8, 1992

		OVERALL	USABLE
CALIFORNIA			
Total Sent	114	72.7%	61.9%
Total Returned	82		
Total Blank	17		
Bad Addresses	2		
Nonoperators*	5		
Blank/Refusals	5		
Referrals**	3		
Duplicate Referrals	4		
FLORIDA			
Total Sent	155	61.2%	54.2%
Total Returned	100		
Total Blank	22		
Bad Addresses	7		
Nonoperators*	8		
Blank/Refusals	6		
Referrals**	5		
Duplicate Referrals	3		
MARYLAND			
Total Sent	236	75.7%	65.5%
Total Returned	182		
Total Blank	49		
Bad Addresses	8		
Nonoperators*	27		
Blank/Refusals	7		
Referrals**	9		
Duplicate Referrals	6		

*Nonoperators include not only those people who no longer own and/or operate the land sampled, but also known bad addresses and deceased (because these are assumed to no longer own/operate the sampled site).

**Referrals are included here for the reader's information only. The number of new referrals remains in the sample totals until we receive information to the contrary.

RESPONSE RATES
as of June 8, 1992
(Continued)

		OVERALL	USABLE
MINNESOTA			
Total Sent	227	72.6%	61.5%
Total Returned	174		
Total Blank	64		
Bad Addresses	10		
Nonoperators*	47		
Blank/Refusals	11		
Referrals**	5		
Duplicate Referrals	1		
NEBRASKA			
Total Sent	241	69.5%	64.1%
Total Returned	166		
Total Blank	18		
Bad Addresses	0		
Nonoperators*	6		
Blank/Refusals	8		
Referrals**	2		
Duplicate Referrals	2		
NORTH CAROLINA			
Total Sent	295	63.7%	41.6%
Total Returned	183		
Total Blank	82		
Bad Addresses	6		
Nonoperators*	35		
Blank/Refusals	4		
Referrals**	24		
Duplicate Referrals	17		

RESPONSE RATES
as of June 8, 1992
(Continued)

		OVERALL	USABLE
TEXAS			
Total Sent	210	65.6%	57.7%
Total Returned	152		
Total Blank	58		
Bad Addresses	15		
Nonoperators*	46		
Blank/Refusals	11		
Referrals**	4		
Duplicate Referrals	1		
WISCONSIN			
Total Sent	352	79.7%	71.2%
Total Returned	282		
Total Blank	57		
Bad Addresses	4		
Nonoperators*	33		
Blank/Refusals	11		
Referrals**	10		
Duplicate Referrals	3		

SECTION 5: DESCRIPTIVE RESULTS

A. OVERVIEW

Presented below are preliminary, descriptive findings on key communication and adoption measures. The intent is to provide an overview of basic characteristics of the samples to allow: (a) early feedback to project planners about the makeup and present dispositions of their target groups; and (b) baseline data for more in-depth analyses and subsequent panel waves.

B. COMMUNICATION FINDINGS

The preliminary findings related to producer communication behaviors are presented below in basic descriptive form. First we consider the overall findings for all samples, and then turn specifically to site-by-site descriptions for baseline purposes.

1. Overall Findings

The data reveal several highly consistent trends in producer communication patterns across all demonstration and comparison areas. These state-by-state similarities are noteworthy not only for subsequent water quality BMP planning efforts, but also for enhanced understanding of agricultural communication and media patterns more generally. While we clearly cannot statistically generalize from these findings to other situations, their consistency across such a varied sample of sites suggests a certain degree of validity.

Information Orientations

Nearly all producers interviewed had heard or read at least something over the previous year about specific things they could do to help protect water quality, and most reported considerably more exposure to the topic (Table 5b1: Tables appear in Section 7). Over half said they had come across a "fair amount" or "a great deal" or information. The most popular sources of information about water quality protection were farm-specific media, including farm magazines, newspapers, newsletters, and broadcast programs. Extension and Soil Conservation agents, and other government and university sources, were generally second, followed typically by conversations with other farmers, general news media, and commercial sources.

These findings suggest that water quality protection is well into the communication agenda of the vast majority of farmers. The higher ranking of agricultural media as a source is

encouraging on two fronts. First, it indicates that the message has successfully gone well beyond the Extension-SCS-university loop of dissemination; second, farm media likely give the issue greater salience and popular legitimacy. It is also notable that producers hear about it more from other farmers and personal associates than from commercial interests.

Also encouraging is that nearly all producers paid at least some attention to information about water quality protection when they came across it, and over a quarter said they paid "a great deal" of attention (Table 5b2). Importantly, over 90% reported at least "a little" need for more information about protecting water quality, and about 40% or more had either "a fair amount" or "a great deal" such need. Similarly, over 80% had looked for information about appropriate farm management practices, with over a quarter having looked "a fair amount" or more. Somewhat disconcerting is that over half of the sample said they had received conflicting information at least some of the time about the best method for helping protect water quality (Table 5b3).

Amplifying on their conversational patterns touched on above, over half talked with other farmers at least "sometimes" about best management practices, and over 80% said environmental regulation was at least sometimes discussed.

Attitudes Related to Water Quality

In their assessments of water quality as a problem, it is clear that producers at all sites follow the common trend of seeing it as less serious close to home, but more serious as distance or the locus of inquiry increases (Table 5b4). While nearly three-fourths regarded it as a "serious" or "very serious" problem nationwide, less than half saw it as that problematic in their own states. The percentage drops significantly more when referring to farmers' own counties, and to under 10% when the locale shifts to their own farms. This "other people's problem" kind of effect is quite common in public opinion studies across a range of social and economic issues.

However, a telling difference occurs in the respondents' answers to a follow-up item asking how much impact they thought farmers had on water pollution problems in each of the locations. Here, the direction of responses almost reverses. Only about one-fourth said farmers had a "moderate" or "major" impact nationwide. But somewhat greater numbers see an impact on their own states, counties, and farmsteads. This suggests that while many operators may regard water quality problems per se as minimal on their own land, they do see themselves as having a certain amount of control over them. Nevertheless, about one half of the sample still see farmers as having little or no impact on water pollution, whether close to home or nationally.

In terms of more specific attitudes, site differences were somewhat stronger. Still, over 40% agreed with the statement that their farm practices had no impact on water quality in their communities (Table 5b5). However, over two-thirds agreed that they had a great responsibility to protect water quality in their communities, that BMPs were readily available to them, and that they would be forced to use BMPs through legislation and regulation if they didn't begin using them on their own.

Source Preferences

What kinds of sources do producers use most for information to help make overall decisions about their operations? Those most often used were general farms magazines (e.g., Farming, Farm Journal, Successful Farming) (Table 5b6). These were typically followed by farm newspapers and commercial farm contacts, including supply dealers, salespeople, buyers, contractors and processors. Grouped together next were -- with some site to site variation -- general daily or weekly newspapers, other farmers, Extension publications, family members, general radio or television news, farm radio programs, and Extension and SCS agents. Less often used were specialized farm magazines, farm meetings, workshops and courses, demonstrations and field days, television farm programs, independent consultants, farm lenders, private newsletters, and landlords or tenants.

If nothing else, the above array indicates that farmers exhibit great diversity in their information choices. Somewhat surprising is the relatively high showing for general media sources, suggesting that these may carry more agriculturally relevant -- and perhaps timely -- information than they are typically given credit for.

Frequency of use of sources does not always equate with which are the most useful for specific purposes. Respondents were asked which source they found most useful for a range of activities. For "day-to-day farm production activities," considerable site-to-site variation occurred (Table 5b7). Generally, the four leading sources included general farm magazines, commercial interests, family members and partners, and farm newspapers. General newspapers, farm radio, Extension agents and publications, and other farmers also appeared key in many states.

Longer-range production or marketing planning made even more use of general farm magazines, followed typically by family members or partners, commercial dealers and farm newspapers (Table 5b8). Some sites gave more emphasis to private newsletters and consultants (e.g., Nebraska), while in others Extension was more utilized (e.g., Maryland).

Looking more closely at the adoption process, general farm magazines, and to a lesser degree farm newspapers, clearly were the most useful sources for awareness of ("first hearing about") new farm practices (Table 5b9). Specialized farm magazines, farm radio, Extension publications and agents, and commercial dealers received sporadic mention as well.

In evaluating new practices before the trial stage, however, general farm magazines and other farmers receided the most mentions (Table 5b10). Closely following for evaluation were demonstrations and field days, Extension publications, and commercial dealers. This shift from media to interpersonal reliance between the awareness and evaluation stages replicates numerous adoption model findings over the decades, with the present data providing more detail on specific sources than previous work.

The next step, trial or "learning how to try out new farm practices," shows continuing dependence on general farm magazines and other farmers (Table 5b11). However, demonstrations and field days approximately tie with those two for number of mentions, with commercial representatives closely behind. Extension agents and publications appear in a second tier of sources.

The most mentioned sources for choosing "the best nutrient and pest management practices" were by far commercial dealers, with independent consultants a significant factor in some states (Table 5b12). Extension agents and publications closely followed. However, for choosing BMP for crediting manure, Extension agents were rated first, followed by general farm magazines, Extension publications, family members or partners, and soil and water conservation agents (Table 5b13).

Finally, soil and water conservation agents were the most mentioned sources for finding out about the nature and extent of water quality problems in one's local community (Table 5b14). They were mentioned by roughly a quarter or respondents across sites, and followed closely by Extension agents. Extension publications, and, importantly, general newspapers, received significant mentions as well.

We should emphasize that while the above findings indicate some clear trends and tendencies, the overall view is one of individual producers using a range of information channels, and that producers can differ substantially in the kinds of media they choose.

2. Demonstration Site Findings

Using the above more general findings as a context, we now turn to examining producer communication orientations within each USDA demonstration project target area. For each, we will first call to attention any general communication findings that may deviate notably from those noted above, or that may be of particular interest with respect to project planning or evaluation. Second, we will address results to specific questions about the USDA project per se. Finally, we will include findings relevant to the particular BMPs assessed within that watershed area.

Monocacy River Watershed Project

Nearly all farmers in the Monocacy River Watershed Project demonstration target area had heard about specific things they could do to help water quality during the previouse year (Table 5b15). The dominant sources of such information were government-university related ones, including Extension and soil conservation agents. These were given higher use ratings in Maryland than elsewhere. Monocacy River producers resembled others in attention paid to information about water quality, perceived need for such information, actively seeking it out, and in discussion patterns (Tables 5b16, 17).

Fifteen percent said water pollution was a "serious" problem on their farms, and other 11% identified it as a moderate one. These proportions were slightly higher than for other sites (Table 5b18). Fifty-three percent believed their farming practices had at least some impact on the water quality of their farms. Maryland farmers were more likely than those elsewhere to see pollution as a problem in their own community, and in their own state. However, only about one-third disagreed with the statement that their practices had no impact on water quality, with nearly half agreeing with it (Table 5b19). Their responses on the remaining attitudinal measures generally followed the pattern of respondents in other states.

Monocacy River area producers tended to rely more on both general and farm newspapers for decisions about their operations, although general farm magazines were still the most-cited source (Table 5b20). Extension publications were ranked just below those, and watershed demonstration project publications were next, ranking higher than in nearly all other states. Monocacy River project demonstrations per se were rated more highly than those in other states.

While different farmers relied on a variety of sources, general farm magazines were the most valued source for day-to-day and long-range production decisions for most farmers, followed by

commercial agents and family members or partners (Tables 5b21, 22). Magazines again were the main sources for both first hearing about new practices and evaluating them, with Extension publications, demonstrations and field days, and other farmers also often mentioned for evaluation (Tables 5b23, 24). However, commercial dealers came to the fore in the trial stage, and for choosing nutrient/pest BMPs (Tables 5b25, 26). Soil and water conservation and Extension agents were the most mentioned sources for choosing manure crediting BMPs (Table 5b27), and for finding out about local water quality problems (Table 5b28). General newspapers and the USDA project publications received several mentions as well, again more than in other states.

BMP-related information sources. Commercial dealers were named by one-third of the sample as their main source for information about split nitrogen application (Table 5b29). General farm magazines and Extension agents followed. For legume and manure crediting, Extension sources were on a par with dealers and magazines (Tables 5b30, 31).

Project awareness. Nearly 82% of these respondents were aware of the Monocacy River Watershed Project, almost the greatest number among all the states (Table 5b49). The highest number first heard of it directly from project publications, with soil and water conservation agents and general newspapers the next most likely sources. Eighty-six percent of those aware of the project also knew about the demonstrations, and nearly one-half of those had visited at least one (Table 5b50). Forty-four percent of those aware of the project overall said it had at least some influence on their own operations.

Anoka Sand Plain Demonstration Project

All producers interviewed in the Anoka Sand Plain Demonstration project area had at least some degree of exposure to water quality-related information (Table 5b15). They were somewhat less likely to have heard about it from government or university sources, however. Information attention and need levels were comparable to those at other sites, but information seeking and discussion levels were slightly lower (Tables 5b16, 17).

Except for seeing water quality as slightly less of a problem in their communities than was the norm, Minnesota farmers rated pollution problems and farmer impact on them in much the same way as did respondents in other states (Table 5b18). However, they were slightly more likely to agree that their practices had no impact on pollution (Table 5b19). Their other attitudes were similar to nationwide averages.

No distinguishing trends appeared in their choice of

information sources for making farm operation decisions (Table 5b20). Magazines and newspapers again dominated, with Extension publications, commercial dealers, and other farmers following. The USDA project publications and demonstrations were rated slightly lower than in other states. However, commercial agents received the most mentions for making day-to-day decisions, outranking magazines or family/partners (Table 5b21). Magazines, however, were named by about half as their main source for hearing about new practices (Table 5b23), and also ranked highest for the evaluation and -- unusually -- the trial stages (Tables 5b24, 25). Minnesotans also ranked general farm magazines more highly for choosing manure BMPs, and to a lesser degree for nutrient/pest BMPs (Tables 5b26, 27).

BMP-related information sources. Commercial agents, meetings or workshops, and general farm magazines were the most cited sources for split nitrogen application information in Minnesota (Table 5b29). Extension agents and family members or partners were mentioned more often for legume and manure crediting, but magazines still topped the list (Table 5b30, 31). For irrigation scheduling, meetings and workshops were mentioned by 21%, with other farmers, magazines, and Extension personnel close behind (Table 5b32).

Project awareness. These respondents ranked quite low in name recognition of their local USDA project as compared to samples in other states, with 41% indicating awareness (Table 5b49). The sources most named were Extension publications and agents, moreso than at other sites. Of those aware of the project, over three-fourths had heard of the demonstrations, with over one-third having visited one (Table 5b50). Twenty-seven percent of those aware said it had at least some influence on their operation.

Mid-Nebraska Demonstration Project

Growers in the Mid-Nebraska Demonstration Project region equalled those at other sites for high overall exposure to information about water quality (Table 5b15). Farm media were their major overall source for such information, and they tended to rely slightly less on government and university sources and slightly more on commercial ones than producers in other states. In addition, they were about equal to others in attention and need for such information, but discussed the issue somewhat more (Tables 5b16, 17).

While they did not see water pollution as a bigger problem on their own farms than other producers did, they perceived it as a less serious issue in their communities and in Nebraska overall (Table 5b18). They also saw themselves as having more impact on pollution on their own land than did other producers. They also

tended slightly more than others to agree that practices were available to them to protect water, and that they had a responsibility to do so (Tables 5b19).

Nebraskans differed in several ways with respect to information sources for farming decisions. For one, they relied decidedly more on commercial dealers, who tied with farm magazines as the most cited source (Table 5b20). Independent consultants also were used more often, along with demonstrations and field days, radio, family members and partners, private newsletters, landlords/tenants, and lenders. Extension publications were mentioned less, but agents were noted as often as at other sites.

Consultants also turned up more often as sources for day-to-day decisions, with consultants and private newsletters mentioned more for longer term planning (Tables 5b21, 22). While most mid-Nebraska farmers first heard about new practices from farm magazines, about a quarter named other farmers for information about evaluation and trial Tables 5b 23-25). Consultants, demonstrations and field days were more central to evaluation and trial in this project area than they were at other sites.

Dealers or consultants were named by nearly four-fifths of Nebraska growers as their most useful source for nutrient/pest BMP information (Table 5b26). Consultants also rival Extension agents as the most cited source of information on the manure BMP (Table 5b27). However, Extension and soil and water conservation agents were somewhat more relied on for finding out about water quality problems than they were in other states (Table 5b28).

<u>BMP-related information sources</u>. Independent consultants were also the most cited choice (by 34%) for information about split nitrogen application, followed by general farm magazines, and distantly by commercial and Extension personnel (11% each) (Table 5b29). Consultants tied with magazines for legume crediting (24% each) (Table 5b30), and with Extension agents for irrigation scheduling (23% each) (Table 5b32). Over one-third also mentioned consultants most often for deep soil nitrate testing, with 16% citing Extension agents (Table 5b40).

<u>Project awareness</u>. Forty-one percent of farmers were aware of the Mid-Nebraska Demonstration Project, with Extension agents and general newspapers the two main sources (Table 5b49). Over 80% of those were of it knew about the demonstrations, and nearly one-third of those had visited one (Table 5b50). Of those aware of it, 29% said the project had at least some influence on their operations.

Water Quality Demonstration Project: East River

Farmers in Wisconsin's East River watershed demonstration area were as exposed as others to water quality BMP information, and generally heard or read such information from the same kinds of sources (Table 5b15). They were slightly less attentive than the norm, but indicated as much of a need for and seeking of such information as producers at other sites (Tables 5b16, 17).

Their perceptions of the seriousness of water pollution and impact of farmers on it approached the norms of those in other states as well (Table 5b18). Two-thirds agreed practices were available to farmers to protect water quality, slightly fewer than average (Table 5b19).

Farm newspapers were the most cited source for farm operation decisions in Wisconsin, closely followed by the more typically mentioned general farm magazines (Table 5b20). Broadcast programs were mentioned more often than at other sites. Significantly, 72% said they read East River project publications at least "sometimes" for decision making, pushing those into the top range of sources.

Farm newspapers were also the most mentioned source for day-to-day as well as long term decisions, and for becoming aware of new practices (Tables 5b21, 23). Demonstrations and field days, and other farmers, led the list for evaluation, with commercial agents the most mentioned for trial purposes (Tables 5b24, 25). Nearly one-half named commercial dealers the most useful source for nutrient/past BMPs, with Extension agents cited by 25% for manure BMPs (Tables 5b26, 27). Soil and water conservation agents, followed by Extension agents and publications, were the most mentioned for finding out about water problems (Table 5b28).

<u>BMP-related information sources</u>. Nearly one-half of the Wisconsin farmers commercial dealers most often cited as their main source for split nitrogen application information (Table 5b29). One-fourth named dealers for information about legume crediting, followed distantly by farm newspapers (15%) and independent consultants and Extension personnel (10% each) (Table 5b30). The same pattern held for manure crediting, with meetings or workshops being somewhat more prominent (Table 5b31). Farmstead assessment sources were evenly divided among Extension and USDA project publications, conservation agents and other producers (Table 5b33).

<u>Project awareness</u>. A substantial 85% of the respondents reported having heard of the USDA East River project (Table 5b49). Virtually all became aware of it through either project or Extension publications, or from personal contact with

conservation or Extension agents. Ninety percent of those aware knew of the field demonstrations, with a third of those having attended (Table 5b50). Just over half of those knowing about it said the project had at least some influence on them.

Rice Water Quality Demonstration Project

Ranchers in California's Rice Water Quality Demonstration Project area had among the highest exposure rates to information about what producers could do to help protect water (Table 5b15). Their main sources were conversations with other growers, as well as farm media and government and university channels.

They were also the most attentive to such material, and generally high in need for more of it and in actively seeking it out (Table 5b16). They discussed it more often, especially in terms of regulatory possibilities (Table 5b17).

Californians were less likely than others to regard water pollution as a problem on their own land, or in their community or state, or nationally (Table 5b18). They were, however, closer to the norm in the impact they thought producers had on pollution. Except for feeling greater responsibility to protect water quality, their attitudinal responses were fairly consistent with those of other producers (Table 5b19).

The rice ranchers were also more likely to use other farmers and family members for information on day-to-day decisions and long-range planning (Tables 5b20-22). Commercial dealers were a significant source as well. Extension agents, as well as other farmers, played more of a role for these producers in first relaying information about new practices; other farmers were clearly the primary source for evaluation and trial of new practices (Tables 5b23-25). However, commercial dealers and consultants remained the source named by most for nutrient/pest BMPs (Table 5b26). And, government agents and newspapers were most often mentioned for information about water problems in the community (Table 5b28).

<u>BMP-related information sources</u>. About one-fifth of the California sample named other ranchers as their main source for information about all four BMPs under study: gravity tailwater recapture, static irrigation, float valve rice boxes, and tail water recirculation (Tables 5b34, 45-47). Also cited for each were Extension publications, and Extension and conservation agents.

<u>Project awareness</u>. Nearly one-half of these California ranchers were aware of the Rice Water Quality Demonstration Project, and two-thirds named Extension agents or publications as their information source (Table 5b49). Nearly all aware of the

project had heard of the demonstrations, and two-thirds of those had gone to one (Table 5b50). Of those familiar with the project, 65% said the project had at least some influence on them.

Lake Manatee Watershed Project

Growers in Florida's Lake Manatee Watershed Area were slightly less exposed to water quality information than other producers, but their information sources were generally consistent with reports from other sites (Table 5b15). They were also somewhat more attentive to and needful of such material, and discussed it more (Tables 5b16, 17).

These Florida respondents also saw water pollution as less of a problem than other producers, and farmers as having less impact on it (Table 5b18). They also reported feeling they had less impact on water pollution, and less responsibility for it (Table 5b19).

For general information about their farm operations, specialized magazines and Extension publications were mentioned most often, with Extension and conservation agents listed closely behind (Table 5b20). General newspapers, general farm magazines, and broadcast media were named less than at other sites. Extension agents ranked particularly high for both day-to-day and long-term decisions, with other farmers mentioned more often as well (Tables 5b21, 22). Specialized magazines, however, were the dominant source, especially for first hearing about new practices (Table 5b23). Other farmers were the most prominent source for evaluation, closely followed by Extension agents, who took the lead for the trial stage (Tables 5b24, 25). Extension personnel were also more highly rated than in other states for nutrient/pest and manure BMP, and local water quality, information (Tables 5b26-28).

<u>BMP-related information sources</u>. Extension personnel were by far the most cited sources for information about water table monitoring and fully closed seep irrigation (Tables 5b35, 36). For system uniformity and efficiency, conservation and Extension agents, and commercial dealers, were closely ranked (Table 5b37). Agents were the most mentioned sources with respect to soil moisture tests (Table 5b38). Agents, commercial dealers and other farmers were grouped as the main sources for multiple application of nutrients (Table 5b39), and agents and dealers the top choices for improved fertilizer management (Table 5b40).

<u>Project awareness</u>. Just over one-half of the sample had heard of the Lake Manatee Watershed Project, with Extension personnel and project publications the most cited sources (Table 5b49). Of those, 63% had heard of the demonstrations, and 44%

indicated the project had some or more influence on them (Table 5b50). A third of those aware had seen a demonstration.

Herrings Marsh Run Watershed Project

North Carolina producers in the Herrings Marsh Run Watershed project target area were slightly above average in exposure to information about water quality, and were the most likely to name government or university sources for the material (Table 5b15). They did not substantially differ from other producers with respect to other information orientations (Tables 5b16, 17).

Nor did they differ from others in perceptions of water pollution problems, except to regard pollution as a somewhat more serious issue in their communities and state, and believing farmers had more of an impact in those areas (Table 5b18. The North Carolina sample did exhibit a greater sense of responsibility for water problems, but were fairly consistent with other producers on the other attitude dimensions (Table 5b19).

Farm newspapers, general farm magazines, and Extension publications were the most mentioned sources for overall decision making (Table 5b20). Lower-than-average ratings were given farm meetings, field days and demonstrations. General newspapers and farm magazines were most apt to guide day-to-day decisions, with the latter ranked first for long-term planning, as well as first hearing about new practices (Tables 5b21-23). Extension sources were the new practices mentioned for new practice evaluation and trial (Tables 5b24, 25). Extension agents were named more often than usual for nutrient/pest BMPs, ranking close to commercial dealers (Table 5b26). Soil and water conservation agents were cited by nearly one-half the sample as the most useful reference for local water quality problems (Table 5b28).

<u>BMP-related information sources</u>. One-half of the North Carolina sample cited Extension publications as their main source of information about poultry composting (Table 5b41). Far behind were Extension and conservation agents, project demonstrations, and farm newspapers.

<u>Project awareness</u>. One-third of the respondents had heard of the Herrings Marsh Run Watershed Project, and most learned of it from Extension or conservation agents (Table 5b49). Of those, 55% said it had some influence on their farm operations (Table 5b50). Nearly two-thirds had also heard of the demonstration projects, and just over one-half of those had attended one.

Seco Creek Demonstration Project

Texans in the Seco Creek Demonstration Project target group had relatively higher exposure levels of information about what they could do to help protect water quality (Table 5b15). However, both government and commercial sources were rated slightly lower than in other states, and general news media slightly higher. Their other information characteristics were similar to those of producers at other sites (Tables 5b16, 17).

These respondents were less likely than others to regard water quality as a problem on their own land, or in their state (Table 5b18). However, 97% agreed that they had a great responsibility to help protect water quality, and their overall attitudes followed those reported for other states (Table 5b19).

As for information sources for farm operation decisions, they were less apt than other respondents to use nearly any of the print sources, including farm magazines and Extension publications (Table 5b20). Their use of other sources was not particularly different from other states, except for being lower over all in many cases. Radio appeared to play a stronger role in day-to-day and longer term decisions (Tables 5b21, 22). However, the most listed source for becoming aware of new practices were Extension publications, followed by general farm magazines (Table 5b23). Demonstrations and field days were the most cited for evaluation and trial (Tables 5b24, 25). Commercial dealers and Extension agents and materials scored higher for choosing nutrient/pest and manure BMPs (Tables 5b26, 27). For water problems, they turned more to general newspapers, conservation agents, and Seco Creek project publications (Table 5b28).

<u>BMP-related information sources</u>. Conservation agents were the most mentioned information sources for rangeland reduced herbicide use (Table 5b42), and they tied with other farmers for riparian area management (Table 5b43). Other farmers and project publications were most often cited for information about prescribed burning (Table 5b44).

<u>Project awareness.</u> Eighty-five percent of the sample was aware of the Seco Creek Demonstration Project (Table 5b49). Most had heard of it either directly from project publications, or from general newspapers. Nearly all were also aware of the demonstration project, and one-third had visited one (Table 5b50). Over 40% of those familiar with the project said it had influenced their operation.

Subsequent analyses will take a more detailed look at the above findings as related to research adoption models and variables, and in the context of the reseach adoption hypotheses and questions posed previously.

C. PRELIMINARY ADOPTION FINDINGS

As previously discussed in the BMP Selection section of the report, a subset of practices being promoted by each state demonstration project was selected for adoption process measurement. The subset was chosen through a combination of the technology classification process and the priority of the practices as identified by state demonstration project staff. The following is a brief summary of adoption processes surrounding these selected practices follows.

1. Overall Findings

A wide disparity occurred between awareness and familiarity of practices between and within demonstration projects. In a majority of the demonstration areas, two-thirds to three-quarters of all respondents were aware of the selected practices. Of the respondents who said they were aware of the practices between 25% and 50% (depending upon the practice) were "mostly" or "completely" familiar with them. There was, however, more variation in claimed adoption of these practices. For example, the lowest claimed adoption was on the practice of dead bird composting in North Carolina. No one in the sample said they used the practice. In sharp contrast, 100% of the Florida vegetable producers claimed to use soil and tissue testing to determine fertilizer rates.

2. Demonstration Site Findings

Monocacy River Watershed Project

Farmers in Maryland were given an explanation of three farm management practices: manure crediting, legume crediting, and split application of nitrogen; from among those being promoted by the Monocacy River Watershed Project. Respondents were asked if they were aware of these practices and their level of familiarity with each.

As can be seen in the Table C-2-8, the highest level of awareness was generated by split application of nitrogen (82.2%), followed by legume crediting (77.6% aware) and manure crediting (71.6% aware).

Few respondents were unfamiliar with any of these practices. Unfamiliarity ranged from a low of 4.6% relative to split application of nitrogen to 10.5% for manure crediting. Fairly high levels of familiarity were claimed for split application of nitrogen. Nearly 18% said they were completely familiar, another 24.8% who said they were mostly familiar, and 31.2% said they were familiar. Another 22.0% said they were somewhat familiar with this practice. In the case of manure crediting, 34.7% said

they were somewhat familiar, a little over quarter (26.3%) were familiar, another 15.6% were mostly familiar, 12.6% said they were completely familiar. The level of familiarity with legume crediting is slightly higher than that of manure crediting. There were 13.5% completely familiar, 19.2% mostly familiar, 30.8% familiar, 28.8% somewhat familiar, and only 7.7% who were familiar.

Even with the high claimed familiarity with these three practices, Table C-2-9 illustrates that many could not form an assessment relative to expense or labor requirements. Between one-quarter and one-third of all respondents didn't know about expenses or labor requirements for these three practices. On the other hand, a little over 10% of the respondents thought that split application of nitrogen would have a high expense. Few had the same assessment of legume and manure crediting. Of those who did have an assessment of manure and legume crediting, the majority said it would be of no or low expense. Just over one-third (34.1%) said split application of nitrogen would have a moderate expense.

Over one-third split application of nitrogen (36.3%) said it would require more work, and another 9.7% said additional labor would have to be hired. This was not the case for manure and legume crediting. Almost one-half favored both practices and said adoption would require no change in labor. Another 12.9% favored manure crediting and 12.2% favored legume crediting said it would require more labor.

Table C-2-10 illustrates the assessment of these three practices relative to complexity and difficulty in making management decisions. Again, approximately one-fifth to a little over one-quarter did not know about these practices relative to these dimensions. Split application of nitrogen was perceived as being somewhat more complex than the two crediting practices. While 31.7% said the practice was not complex, another 46.1% said it was somewhat complex, complex, or very complex. Approximately two-fifths of the respondents gave a "not complex" rating to manure crediting (44.5%) and legume crediting (44.1%). Around a quarter of the respondents said these practices were complex, complex, or very complex.

The pattern of responses relative to difficulty in making management decisions was nearly identical with that of complexity. That is, split application of nitrogen is perceived as slightly more difficult than the other two practices; the largest response category for any practice are those saying it is not difficult, and few give these practices a very difficult rating.

The practicality and perceived risk associated with these practices is shown in Table C-2-11. Between one-fifth and one-

quarter of all respondents didn't know enough about these practices to give an assessment on these dimensions. Manure crediting and split application of nitrogen are viewed as less practical than legume crediting. Only one-fifth (21.8%) of the respondents said split application was practical, and another 6.5% saying it was very practical. This is contrasted to 44.4% saying manure crediting is practical or very practical, and 47.2% saying the same for legume crediting.

Approximately a quarter (split application of nitrogen) to a third (manure crediting) had no assessment on the practices relative to risk. There were 14.6% who said split application had medium or high risk. Less than 5.0% said the same about the two crediting practices. For these two practices the majority said there was no or low risk.

The perceived efficacy of these practices for affecting water quality at the farm and community level is presented in Table C-2-12. While few believed these practices would cause more pollution at the farm level, approximately one-fifth said the three practices would not hurt or help water quality. Less than one-fifth who said these practices would prevent water quality problems, but not improve it. The remainder said split application of nitrogen (35.2%), legume crediting (29.4%) and manure crediting (31.5%) would improve water quality at the farm level.

Respondents were then asked about the same practices relative to a community level of water quality. Again, approximately 30% of all respondents could not give an assessment of these practices. Among the remaining respondents, the practices were perceived as being more efficacious at the community than the farm level. Almost two-fifths of all respondents said each of these practices would improve water quality at the community level. Another approximately 15% said the practices would prevent further pollution, but not improve existing water quality problems.

Table C-2-13 shows the perceptions of the respondents relative to the impact on profitability and the ease of obtaining information on these practices. Consistent with earlier tables, approximately one-quarter of all respondents did not have an assessment. Of those who did, 63.6% said manure crediting, and 61.1% said legume crediting, would improve profitability. Only 46.9% had the same assessment for split application of nitrogen. Few respondents said any of these practices would decrease profits or even not change profits.

About one-fifth of the respondents for each practice didn't know about the ease of obtaining information. While very few said it would not be easy, most felt it would be somewhat easy or easy to get information on each practice. Split application of

nitrogen is perceived as being the easiest to obtain information on.

Current Behavior. Those claiming to use (adopt) the three practices is presented in Table C-2-14. A little over one-third (36.9%) claim to credit manure in determining crop nutrient requirements. Slightly less, 29.9%, claim to credit nitrogen following a legume rotation. Only 10.9% said they are currently using some form of split application of nitrogen in corn production.

Additional behavioral data is under analysis.

Mid-Nebraska Demonstration Project

Four different practices were evaluated as part of the Nebraska demonstration project. A very high level of awareness was found for all four practices (Table C-2-15). The lowest, 85.8%, is for legume crediting while the remaining three practices have levels of awareness in the mid-ninties.

There is more variability, however, relative to the level of familarity with these practices. At least one-half of all respondents said they were completely familiar or mostly familiar with split application of nitrogen (52.5%), irrigation scheduling (54.6%) and deep soil nitrate testing (60.0%). Another quarter said they were familiar with these practices. Respondents had lowest level of familarity with legume crediting. Here 29.4% said they were only somewhat familiar, and only 38.9% said they were completely or mostly familiar.

Table C-2-16 illustrates the perceived expense and labor requirements associated with these practices. The highest perceived expense was associated with split application of nitrogen. Here 16.7% said it has a high expense, and another 47.9% said it has moderate expense. Only one-fifth of the respondents said irrigation scheduling (20.3%) or deep soil nitrate testing (21.5%) had high or moderate expenses. Legume crediting had the lowest totals in these latter two categories (12.4%). Yet, of the respondents 17.9% said they didn't know the expense associated with legume crediting.

Split application of nitrogen was perceived as increasing labor requirements more so than the other three practices. Almost one-fifth (18.8%) said they would have to hire additional labor to use this practice, and 66.7% said it would require more work by existing labor. Irrigation scheduling was also perceived as increasing labor requirements. In addition 47.3% viewed this practice as requiring more work from existing labor, or having to hire additional labor. The same statistic for deep soil nitrate testing was 31.2%. Again, legume crediting had almost a quarter

(24.1%) who did not know about this practice and labor requirements. Of those who did, the majority said it would not change existing labor patterns.

Table C-2-17 presents the assessments of these practices relative to complexity and difficulty in making management decisions. Split application of nitrogen had the highest level of perceived complexity. Just over one-third (35.0%) said this practice was complex or very complex. On the other end of the complexity spectrum, just under two-thirds (64.8%) said deep soil nitrate testing was not complex. Almost one-half (48.3%) said this about legume crediting and two-fifths (44.1%) about irrigation scheduling.

Few respondents viewed any of the practices as making management decisions more difficult. The majority for all practices said they would not be difficult to manage in their operations.

Two of the four practices received a high rating on practicality (Table C-2-18). Two-thirds (66.2%) said deep-soil nitrate testing was practical or very practical. Irrigation scheduling was practical or very practical 55.6% of the respondents. Legume crediting also had 45.1% of the respondents who gave this practice a similar rating. Split application of nitrogen had the lowest practicality rating as over one-third (36.6%) said it was not practical.

Split application of nitrogen also had the highest perceived risk. There were 37.9% of the respondents who said this practice was of medium or high risk. This was at least twice the percentage of any of the other practices. The largest response category for the other three practices said the practice had no risk.

The perceived impact of these practices on water quality at the farm and community level is presented in Table C-2-19. All the practices are perceived as being beneficial to water quality at the farm level. Over one-half (57.1%) said deep soil nitrate testing would improve water quality on the farm. Slightly less said the same about split application of nitrogen (48.2%) and irrigation scheduling (44.7%). Only 37.1% said this about legume crediting, but this could be due to the 23.6% who could not form an assessment about this practice.

The pattern is almost identical when moving from the farm to the community level of analysis. Again, approximately one-half of the respondents said water quality improvement would occur for deep soil nitrate testing (50.7%), split application of nitrogen (47.8%), and irrigation scheduling (44.9%).

Table C-2-20 illustrates the perceived impact on profitability from using these practices, and the ease of obtaining information about them. All of the practices except split application of nitrogen, have a majority of respondents saying the practices will increase profits. Only 37.9% of the respondents said this about split application of nitrogen. One-fourth said split application of nitrogen, irrigation scheduling and deep soil nitrate testing would not change profits.

Over three-quarters of the respondents said obtaining information on these practices was easy or somewhat easy. Excluding those not having an assessment for legume crediting, very few said getting information on these practices would be difficult.

Currrent Behavior. Approximately one-half (49.6%) of the respondents said they were using legume crediting in their operations (Table C-2-21). Just over one-third (35.5%) said they were using deep soil nitrate testing, but only one-fifth (19.4%) said they had adopted split application of nitrogen.

Irrigation scheduling is a composite of a number of individual management practices. Table C-2-22 presents the use of a number of these behaviors associated with determining when and how much water to apply with a irrigation system. Most (63.0%) of the respondents base irrigation decisions on independent crop consultant recommendations. A large group (63.0%) base these irrigation decisions on their own intuition and experience and past rainfall (55.4%). This is supported by the 20.7% who use a set watering interval. A smaller number are beginning to use the behaviors associated with irrigation scheduling, i.e., measuring soil water holding capacity (39.1%), using reported values of crop water use (33.7%), and considering the expected temperature on watering days (22.8%).

Data analyses continue on these behavioral measures.

Water Quality Demonstration Project: East River

Four practices were evaluated in the East River Water Quality Demonstration Project (Table C-2-23). Approximately three-quarters of all respondents are aware of manure crediting (79.3%), legume crediting (82.1%), and split application of nitrogen (73.5%). The most recent Farmstead Assessment System showed that only one-fifth (19.6%) were aware of it.

The level of familarity was then assessed for those who were aware of the practices. None of the practices had a high level of familarity associated with it. Approximately one-third to two-fifths reported being mostly or completely familiar with manure crediting (35.1%), legume crediting (44.1%), and split

application of nitrogen (42.8%). Among one-fifth who were aware of the Farmstead Assessment System, only one-fifth of those said they were completely or mostly familiar with it. The majority of respondents for all practices said they were somewhat familiar or familiar with them.

Perceived expense and labor requirements associated with these practices is presented in Table C-2-24. The legume and manure crediting practices have at least two-thirds saying the practice would involve low or no expense. Only one-third (34.6%) said the same about split application of nitrogen. The majority of those aware of the Farmstead Assessment System could not evaluate it relative to expense or labor requirements.

Most viewed no change in labor requirements for manure crediting (62.4%) and legume crediting (63.8%). However, one-half (49.5%) said split application of nitrogen would create more work for existing labor, and another 8.2% said additional labor would have to be hired.

The results regarding perceived attributes of complexity and difficulty for management decisions are presented in Table C-2-25. A consistent pattern is emerging in that legume and manure crediting is perceived as different from split application of nitrogen, and few could assess the Farmstead Assessment System. In particular, legume and manure crediting is viewed as less complex and being less difficult than split application of nitrogen.

The same pattern holds true relative to the attributes of practicality and perceived risk as reported in Table C-2-26. While a majority view manure crediting (67.7%) and legume crediting (70.6%) as being practical or very practical, only 32.5% gave the same ratings to split application of nitrogen. There were 45.0% who said split application of nitrogen was not practical or only somewhat practical. Again, no interpretation is possible relative to the Farmstead Assessment System due to the low numbers involved.

At least three-quarters said that manure crediting (76.5%) and legume crediting (80.5%) involved low or no risk. There were 61.5% who gave a similar assessment to split application of nitrogen. However, there were 15.8% who said split application of nitrogen involved medium or high risk.

Except for the Farmstead Assessment System, at least one-half of the respondents said the practices would at least prevent further water quality degradation or improve water quality at the farm level (Table C-2-27). Specifically, 55.9% said this of manure crediting, 57.8% gave these replies for legume crediting, and 54.3% said this for split application of nitrogen. At the same time approximately one-fifth of all respondents said these

three practices would neither help or hurt water quality at the farm level.

The potential efficacy of these practices increases when examining them at the community level. Currently between two-fifths and one-half of the respondents say these same practices will improve water quality. Manure crediting has 49.5% who say this, legume crediting has 50.2%, and split application of nitrogen finds 42.9% saying it will improve water quality at the community level.

The impact of these practices along with the ease of obtaining information about them is presented in Table C-2-28. Three-quarters say that manure crediting (75.6%) and legume crediting (75.1%) will increase profitability. Another 11.0 and 10.0% say these practices, respectively, will not influence profitability. For split appliction of nitrogen, only 46.2% said it will increase profits, and another 23.1% said it will have no impact on profitability.

Approximately two-fifths say that manure crediting (42.6%), legume crediting (44.2%), and split application of nitrogen (40.6%) would be easy to obtain information about. An equal number say that obtaining this information would be somewhat easy.

Current Behavior. Table C-2-29 presents the claimed adoption relative to the first three practices. There were 62.7% saying they already credit manures, 54.0% saying theycredit legumes, and 17.7% saying they split apply nitrogen in the production of corn.

Additional behavioral analyses are underway.

Rice Water Quality Demonstration Project

Perception of Practices. Respondents were given an explanation of four management practices (tailwater recirculation, gravity tailwater recapture, static (Pearson) irrigation system, float valve rice boxes) and asked if they were aware of, and the extent to which they were familiar with each.

Table C-2-1 indicates that the majority of respondents were aware of all four management practices. The most widely recognized practice was static (Pearson) irrigation systems. Eighty-four percent of the respondents said they were aware of static irrigation systems. The least recognition was of tail water recirculation systems with 65% of respondents saying they were aware of the practice.

The associated level of familiarity for those claiming to be aware of the practices is also presented in Table C-2-1. For those respondents who indicated that they were aware of the

practices, we looked at the extent to which they believed they were familiar with the practice. For those who were aware of tailwater recirculation systems, 46.2% claimed to completely familiar with how to use them, 46.2% were familiar or mostly familiar. Thirty-two percent of rice producers who said they were aware of gravity tailwater recapture systems were completely familiar with them while an additional 50.0% were familiar or mostly familiar with how to use them. Likewise, 27.3% of growers aware of static (Pearson) systems were completely familiar with how to use them and 49.0% were familiar or mostly familiar with their use. However, only 17.4% of those aware of float valve rice boxes were completely familiar with how to use them. This rises significantly to 45.6% when responses for familiar or mostly familiar are calculated. Thirteen percent of the respondents said they were unfamiliar with the float valve rice boxes. None of the other practices had a large number of respondents with claimed unfamiliarity.

The respondents next evaluated the four practices being promoted in the Rice Water Quality Demonstration Project along a series of dimensions found to influence adoption behavior. The respondents' assessments regarding the expense of using and labor requirement are presented in Table C-2-2. Relative to expense, two patterns are evident. First, there is a significant number who had no assessment relative to three practices (36.5% for float valve rice box, 28.1% for static Pearson irrigation system, and 25.0% for the gravity tailwater recapture system). That is, they did not have sufficient information or experience to make an assessment and consequently gave a "don't know" answer. Second, with the exception of tailwater recirculation system, a majority viewed that these practices had either low or moderate expenses. The tailwater recirculation system had 47.6% who said it had a moderate expense, and 41.3% who said it would require high expenses.

Perceived labor requirements find a majority either not knowing the labor requirements, or stating there would be no change in labor requirements. More work for existing labor was cited by 29.0% for tailwater recirculation systems, 16.1% for gravity tailwater recapture systems, 19.4% for static Pearson systems, and 14.5% for float valve rice boxes.

The result regarding the assessed complexity in using and difficulty in making management decisions are presented in Table C-2-3. While only 6.5% did not have a complexity assessment for the tailwater recirculation system, there were 24.2% with one for the gravity tailwater recapture system, 21.0% for the static (Pearson) irrigation system, and 30.6% for the float valve rice boxes. The highest perceived complexity is associated with the tailwater recirculation system where one-third (33.8%) said it was complex or very complex. An almost equal number (32.3%) said this same system was not complex. This same contrasting view is

found for the other three practices as well. The percentage of respondents saying a practice is complex or very complex approximately equals the percentage saying it is not complex.

Also in Table C-2-3 is the assessment of these practices relative to the difficulty in making management decisions. With the exception of the tailwater recirculation system (13.1%), approximately one-third have no assessment for the remaining three practices. Of those who do, the majority say these practices are either not difficult or somewhat difficult relative to making management decisions.

Table C-2-4 illustrates the assessed practicality of using each practice as well as the perceived risk of using them. The gravity tailwater recapture system and the static (Pearson) irrigation system had the lowest practicality ratings. There were 26.2% who said both systems were not practical. Another 27.9% said the gravity tailwater recapture system was only somewhat practical. The comparable percentage for the static (Pearson) irrigation system was 26.2%. The system with the highest perceived practicality was the tailwater recirculation system where 27.4% said it was very practical. None of the remaining three practices came close to this level even when combining the practical and very practical categories.

None of the practices were viewed by a large number of respondents as having a high risk. Tailwater recirculation systems had just over one-fifth (21.3%) saying the system had medium or high risk. Next was the static (Pearson) irrigation system with 20.7% expressing similar assessments relative to risk. The remaining two practices had less than 15% of the respondents saying it had medium or high risk.

The efficacy of these practices relative to affecting water quality was also tested for the farm and community level as illustrated in Table C-2-5. The tailwater recirculation system had over one-third (35.5%) saying it would improve water quality. Approximately one-fifth said the static (Pearson) irrigation system (21.3%) and the gravity tailwater recapture system (19.7%) would improve water quality. Only 9.8% said this about the float valve rice box. With the exception of the tailwater recirculation system (14.5%), the largest response categories were those not knowing the impact of the gravity tailwater recapture system (36.1%), static (Pearson) irrigation system (37.7%), and the float valve rice box (45.9%).

A similar pattern is found relative to the levels of perception regarding effects on community water quality. The one exception is the significantly larger number saying these practices would improve water quality at the community level. In particular, there were 44.4% who said this about the tailwater recirculation system, 32.3% about the gravity tailwater recapture

system, 29.0% about the static (Pearson) irrigation system, and 22.6% about the float valve rice box. Between 12.7% and 43.5% had no perception of its effects on community water quality.

The results for respondents being asked about profitability and the ease of obtaining information on these practices is presented in Table C-2-6. A fairly substantial number said that each practice would decrease profitability. The largest is for the tailwater recirculation system, where over one-third (36.1%) said it would decrease profits. Between 16% and 20.0% had the same assessment for the other three practices. Yet these statistics are countered by the approximate one-quarter (27.9%) to almost one-half (45.9%) who don't know the impact of these three practices on profitability. About one-third to two-fifths of all respondents see no change in profits associated with using these systems. About one-fourth (24.6%) viewed the tailwater recirculation system as increasing profits.

A majority of respondents said that obtaining information on these systems was either easy or somewhat easy. A sizeable number said they did not know about obtaining information (3.1% to 28.6%), but few said it was not easy.

<u>Current Behavior</u>. Some of the prior inconsistencies in assessments of practices begin to be clarified when examining current behavior. The irrigation system currently in use by these respondents is presented in Table C-2-7. The largest group are the 46.2% who hold water from rice production under a conventional system. This is followed by one-fourth who use a tailwater recirculation system. Of those using a tailwater recirculation system, the majority (63.4%) have their own system, while another 29.3% are on a district-wide system. Currently 15.6% hold water on set-aside acreage until it is feasible to discharge it.

Additional behavioral items are under analysis.

Anoka Sand Plain Demonstration Project

Respondents received an explanation of four management practices: manure crediting, legume crediting, split N application, and irrigation scheduling. Respondents were asked if they were aware of these practices and their level of familiarity with each practice.

Table C-2-30 indicates that the majority of respondents were aware of all four management practices. The respondents' awareness ranged from 82.6% for legume crediting to 58.7% for irrigation scheduling.

The associated level of familiarity for those claiming to be aware of the practices is also presented in Table C-2-30. Those claiming to be completely aware were 27.4% for split N application, 15.6% for irrigation scheduling, 10.0% for legume crediting, and 4.8% for manure crediting. Those saying they were familiar or mostly familiar were 52.3% for manure crediting, 61.1% for legume crediting, 62.1% for split N application, and 46.9% for irrigation scheduling. There were 9.4% of the respondents who said they were unfamiliar with irrigation scheduling. Few respondents claimed little familiarity with any of the other practices.

Next the respondents evaluated the four practices being promoted in the Anoka Sand Plain Demonstration Project along a series of dimensions found to influence adoption behavior. The respondents' assessments regarding the expense of using and labor requirement are presented in Table C-2-31. Relative to expense, two patterns are evident. First, there is a significant number who had no assessment relative to three practices (40.0% for irrigation scheduling, 30.5% for manure crediting, and 22.1% for the legume crediting). That is, they did not have sufficient information or experience to make an assessment and consequently gave a "don't know" answer. Second, except for manure crediting and irrigation scheduling, a majority viewed that these practices had either low or moderate expenses. None of the other practices had a large number of respondents who said it would be very expensive.

For perceived labor requirements, a majority either did not know the labor requirements, or stated there would be no change in labor requirements. More work for existing labor was cited by 47.0% for split N application, 22.9% for irrigation scheduling, 12.0% for manure crediting, and 9.9% for legume crediting.

The results regarding the assessed complexity in using and difficulty in making management decisions are presented in Table C-2-32. Nearly 29.7% did not have a complexity assessment for the manure crediting; there were 20.6% with this assessment for the legume crediting, 15.7% for the split N application, and 42.6% for irrigation scheduling. The highest perceived complexity is associated with the split N application where 22.5% said it was somewhat complex. None of the practices had a large number of respondents who viewed the practices as complex and very complex.

Also in Table C-2-32 is the assessment of these practices relative to the difficulty in making management decisions. With the exception of the split N application (13.7%), between 17.5% and 42.7% respondents have no assessment for the remaining three practices. Of those who do, the majority say these practices are either not difficult or somewhat difficult relative to making management decisions.

Table C-2-33 illustrates the assessed practicality of using each practice as well as the perceived risk of using them. The split N application and the legume crediting had the lowest practicality ratings. An almost equal number (29.8%) said the both practices were practical. The practice with the highest perceived practicality was the split N application, where 30.1% said it was very practical.

None of the practices had a large number of respondents who viewed the practices as having a medium and high risk. An equal 29.4% said the split N application and the legume crediting practices having low risk. The remaining two practices had over 16% of the respondents saying it had low risk.

The efficacy of these practices relative to affecting water quality was also tested for the farm and community level as illustrated in Table C-2-34. The split N application had almost one-half (43.6%) saying it would improve water quality. A little less than one-half said the legume crediting (41.2%), the irrigation scheduling (29.0%), and the manure crediting (27.3%) would improve water quality. Exception for legume crediting (16.7%) and split N application (17.8%), the largest response category was those not knowing the impact of irrigation scheduling (41.9%) and manure crediting (25.3%).

A similar pattern emerges relative to the levels of perception regarding effects on community water quality. The one exception is the significantly larger number saying these practices would improve water quality at the community level. In particular, there were 43.7% who said this about the split N application, 39.8% about the legume crediting, 35.1% about the irrigation scheduling, and 31.1% about manure crediting. Between 18.4% and 38.1% had no perception regarding effects on community water quality.

The results for respondents being asked about profitability and the ease of obtaining information on these practices is presented in Table C-2-35. There is a fairly substantial number saying that each practice would increase profitability. The largest is for the legume crediting, where 71.3% said it would increase profits. Between 51.6 and 69.0% had the same assessment for the other three practices. Yet between 18.0% and 39.8% didn't the impact of these three practices on profitability. None of the practices had a large number of respondents who viewed them as having no change in profit and decrease profit.

A majority of all respondents said that obtaining information on these systems was either easy or somewhat easy. While there was a sizable number not knowing about obtaining information, between 15.5 and 30.9%; very few said it was not easy.

Lake Manatee Watershed Project

Respondents were given an explanation of seven management practices: multiple applications of nutrients, irrigation system testing, soil moisture testing, improved fertilizer management, water table monitoring, seep irrigation and irrigation scheduling. The first three practices apply to Florida Citrus Producers, the next three apply to Florida Vegetable Producers, and the last practice applies to both. Respondents were were asked if they were aware of the practices appropriate to their area and their level of familiarity with each practices.

Tables C-2-49, C-2-50, and C-2-51 indicate that the majority of respondents were aware of the seven management practices. The respondents' awareness ranged between 94.5% being aware of multiple applications of nutrients to 71.7% being aware of soil moisture testing.

The level of familarity was then assessed for those who were aware of the practices. Most of the practices had a fairly high level of familarity associated with it. Approximately one-half to two-thirds reported being mostly or completely familiar with irrigation system testing (45.7%), irrigation scheduling (47.7%), water table monitoring (52.4%), seep irrigation (56.5%), improved fertilizer management (57.1%), and multiple applications of nutrients (69.3%). Among the seventy percent who were aware of soil moisture testing, only 35% of those said they were completely or mostly familiar with it.

The respondents next evaluated the six practices being promoted in the Lake Manatee Watershed Project along a series of dimensions found to influence adoption behavior. The respondents' assessments regarding the expense of using and labor requirement are presented in Tables C-2-52, C-2-53, and C-2-54. There is a fairly significant number of Florida Citrus Producers who had no assessment relative to three practices (28.6% for soil moisture tests, 22.4% for irrigation system tests, and 17.3% for multiple applications of nutrients). That is, they did not have sufficient information or experience to make an assessment and consequently gave a "don't know" answer. On the whole, except for seep irrigation, a majority viewed that these practices had either low or moderate expenses. Mechanical brush control had 25.0% who said it had a moderate expense, and 58.3% who said it would require high expenses.

For perceived labor requirements, a majority stating either that there would be no change in labor requirements or that more work would be created for existing labor. The need to hire additional labor is cited for seep irrigation (25.0%). Again, for irrigation system testing and soil moisture testing, a fairly significant number (22.4 and 28.6% respectively) could make no assessment.

The results regarding the assessed complexity in using and difficulty in making management decisions are presented in Tables C-2-55, C-2-56, and C-2-57. The highest perceived complexity is associated with seep irrigation, where about one-third said it was complex or very complex. However, an even greater number (61.0%) said this same system was not complex or only somewhat complex. This same view is found for the other practices as well. Respondents saying a practice is not complex or somewhat complex greatly exceeds those saying it is complex or very complex.

Also shown is the assessment of these practices relative to the difficulty in making management decisions. Soil moisture tests and seep irrigation have the highest number of those without an opinion (16.7%). Of those who do have an assessment, the majority say these practices are either not difficult or somewhat difficult relative to making management decisions. Improved fertilizer management, with 20.8% rating it difficult, is the only exception.

Tables C-2-58. C-2-59, and C-2-60 illustrate the assessed practicality of using each practice as well as the perceived risk of using them. Seep irrigation had the lowest practicality ratings. There were 12.5% who said this practice was not practical. Except for soil moisture testing, where the tendency of respondents leaned towards the category of only somewhat practical, the majority of other practices were rated either practical or very practical. Water table monitoring was rated most practical, with 79.1% assessing it as either practical or very practical.

None of the seven practices had a large number of respondents who viewed it as having a high risk. Only seep irrigation with 21.7% and improved fertilizer management with 20.8% had ratings of higher than 10% in the category of medium risk. The majority said all other practices would have no risk.

The efficacy of these practices relative to affecting water quality was also tested for the farm and community level as illustrated in Tables C-2-61, C-2-62, and C-2-63. Approximately one-third to one-half said irrigation scheduling (30.6%), multiple applications (35.4%), water table monitoring (37.5%), seep irrigation (41.7%), and improved fertilizer management (52.0%) would improve water quality. Only 21.7 and 23.9% said this about soil moisture tests and irrigation system tests, respectively. Nobody claimed that any of these practices would increase pollution.

A similar pattern is found relative to the levels of perception regarding effects on community water quality. As is the case at the farm level, the majority say that these practices

either improve water quality or do nothing to either hurt or help. Again, soil moisture tests and irrigation system tests are rated lower than the other practices.

The result of respondents being asked about profitability and the ease of obtaining information on these practices is presented in Tables C-2-64, C-2-65, and C-2-66. Between 40 and 50% of respondents say that each practice would increase profitability, with the exception of seep irrigation at only 30%. Approximately 30% overall assessed that these practices would not change profit. In most cases another 15% claimed that these practices would decrease their profits.

A majority of all respondents said that obtaining information on these systems was either easy or somewhat easy. While there was a small number not knowing about obtaining information, even fewer said it was not easy. Only improved fertilizer management and seep irrigation are exceptions here, where more claim information is not easy to obtain compared with those offering no assessment.

Data current behavior are under analysis.

Herrings Marsh Run Watershed Project

Three practices were evaluated in the Herrings Marsh Run Watershed Project (Tables C-2-67, C-2-68, and C-2-69). The majority of respondents are aware of animal waste crediting (70.4%), poultry composting (72.7%), and split application of nitrogen (84.4%).

The level of familiarity was then assessed for those who were aware of the practices. Only split application of N had a high level of familiarity associated with it, where 66.1% said they were mostly or completely familiar with the practice. Only one-fifth to one-quarter reported being mostly or completely familiar with animal waste crediting (27.2%) and poultry composting (18.8%). The majority of respondents for these two practices said they were somewhat familiar or familiar with them.

Perceived expense and labor requirements associated with these practices is presented in Tables C-2-70, C-2-71, and C-2-72. For all three practices, at least one-half say the practice would involve low or moderate expense. A high number of those aware of poultry composting could not evaluate it relative to expense or labor requirements.

Most viewed no change in labor requirements for animal waste crediting (53.9%) and split application (51.4%). Poultry composting, however, found two-fifths saying it would create more work for existing labor, and another 20% saying additional labor would have to be hired.

The results regarding perceived attributes of complexity and difficulty for management decisions are presented in Tables C-2-73, C-2-74, and C-2-75. A consistent pattern is emerging in that split application of N and animal waste crediting is perceived as slightly different from poultry composting. In particular, split application and animal waste crediting are viewed as less complex and being less difficult than poultry composting.

To an extent, the same pattern holds true relative to the attributes of practicality and perceived risk as reported in Tables C-2-76, C-2-77, and C-2-78. While a significant number view split application (65.8%) and animal waste crediting (40.0%) as being practical or very practical, only 25.0% gave the same ratings to poultry composting. There were 45.0% who said poultry composting was not practical or only somewhat practical.

At least two-thirds said that animal waste crediting (66.7%) and split application (77.9%) involved low or no risk. There were 55.0% who gave a similar assessment to poultry composting. However, there were 17.2% who said animal waste crediting involved medium or high risk.

Only thirty percent of the respondents said the practices would at least prevent further water quality degradation or improve water quality at the farm level (Tables C-2-79, C-2-80, and C-2-81). Specifically, 28.7% said this of animal waste crediting and 42.6% gave these replies for split application of N. Only 10.5% said this for poultry composting. At the same time about one-third or more of respondents said these three practices would neither help or hurt water quality at the farm level.

The potential efficacy of these practices increases when examining them at the community level, where between one-third and half of the respondents say these same practices will improve water quality. Animal waste crediting has 43.0% who say this, split application has 49.4%, and poultry composting finds 33.3% saying it will improve water quality at the community level.

The impact of these practices along with the ease of obtaining information about them is presented in Tables C-2-82, C-2-83, and C-2-84. about one-half say that animal waste crediting (53.3%) and split application (44.6%) will increase profitability. Another 16.3 and 24.3% respectively say these practices will not influence profitability. Poultry composting, however, finds only 31.6% saying it will increase profits, and another 26.3% saying it will have no impact on profitability.

Approximately three-quarters say that animal waste crediting (72.6%), poultry composting (73.6%), and split application of nitrogen (78.9%) would be easy to obtain information on. A somewhat significant number say that they do not know about the ease of obtaining information.

Current Behavior. Tables C-2-85 and C-2-86 present the claimed adoption for the first two practices. There were 78.1% saying they already credit animal waste and 59.5% saying they split apply nitrogen in the production of corn.

Additional behavioral data are under analysis.

Seco Creek Demonstration Project

Respondents were given an explanation of six management practices: prescribed burning, reduced herbicide usage, mechanical brush control, riparian area management, soil testing, and split application of N. The first four practices apply to the Texas rangeland area, while the last two apply to the Texas farmland area. Respondents were given the opportunity to skip one of the two areas if it did not apply to them, then were asked if they were aware of these practices and their level of familiarity with each practices.

Tables C-2-36 and C-2-37 indicate that the majority of respondents were aware of five of the management practices. The respondents' awareness ranged between 97.5% being aware of mechanical brush control to 54.5% being aware of split application of nitrogen. Only awareness of riparian area management lagged behind at 30.8%.

The level of familarity was then assessed for those who were aware of the practices. None of the practices had a high level of familarity associated with it. Approximately two-fifth to one-half reported being mostly or completely familiar with soil testing (40.0%), split application of N (50.0%) and mechanical brush control (59.0%). Among one-third who were aware of riparian area management, only one-third of those said they were completely or mostly familiar with it. For prescribed burning and reduced herbicide usage, less than one-fourth of those aware were very familiar with these practices. The majority of respondents for all practices said they were somewhat familiar or familiar with them.

Next the respondents evaluated the six practices being promoted in the Seco Creek Demonstration Project along a series of dimensions found to influence adoption behavior. The respondents' assessments regarding the expense of using and labor requirement are presented in Table C-2-38 and C-2-39. Relative to expense, two patterns are evident. First, there is a significant number who had no assessment relative to three practices (57.1% for riparian area management, 40.9% for split application of N, and 40.5% for reduced herbicide usage). That is, they did not have sufficient information or experience to

make an assessment and consequently gave a "don't know" answer. Second, with the exception of mechanical brush control, a majority viewed that these practices had either low or moderate expenses. Mechanical brush control had 32.4% who said it had a moderate expense, and 51.4% who said it would require high expenses.

Perceived labor requirements find a majority either not knowing the labor requirements, or stating there would be no change in labor requirements. More work for existing labor was cited by 26.3% for mechanical brush control, 19.0% for split application of N, 18.9% for reduced herbicide usage, and 16.2% for prescribed burning. 36.8% cited the need for additional labor for mechanical brush control.

The results regarding the assessed complexity in using and difficulty in making management decisions are presented in Tables C-2-40 and C-2-41. While only 10.0% did not have a complexity assessment for soil testing, there were 23.8% with this assessment for split application, 33.3% for reduced herbicide usage, and 69.4% for riparian area management. The highest perceived complexity is associated with mechanical brush control, where a quarter said it was complex or very complex. An even greater number (44.4%) said this same system was not complex. This same contrasting view is found for the other three practices as well. The percentage of respondents saying a practice is complex or very complex approximately equals the percentage saying it is not complex, except for soil testing, where the large majority (75.0%) say it is not complex.

Also in Tables C-2-40 and C-2-41 is the assessment of these practices relative to the difficulty in making management decisions. With the exception of riparian area management and reduced herbicide use (64.9% and 29.7% respectively), the majority were able to assess the remaining four practices. Of those who did, the majority say these practices are either not difficult or somewhat difficult relative to making management decisions.

Tables C-2-42 and C-2-43 illustrate the assessed practicality of using each practice as well as the perceived risk of using them. Prescribed burning had the lowest practicality ratings. There were 32.4% who said this practice was not practical. 25.0% said reduced herbicide use was somewhat practical. The system with the highest perceived practicality was mechanical brush control, where 28.9% said it was very practical. Interestingly, prescribed burning, along with reduced herbicide use and soil testing, came close or achieved a higher level when combining the practical and very practical categories.

Only prescribed burning with 24.3% had a large number of respondents who viewed the practices as having a high risk.

Reduced herbicide use was next with just under one-fifth (19.4%) saying the system had medium risk. The remaining four practices had less than 10% of the respondents saying it had medium or high risk.

The efficacy of these practices relative to affecting water quality was also tested for the farm and community level as illustrated in Tables C-2-44 and C-2-45. Approximately one-fourth to a fifth said mechanical brush control (26.3%), prescribed burning (21.6%), and reduced herbicide use (21.1%) would improve water quality. Only 9.5% said this about split application of N. With the exception of riparian area management and split application, the largest response category was that for claiming the practices would not hurt or help, with soil testing at 50% leading the way.

A similar pattern is found relative to the levels of perception regarding effects on community water quality. At this level, reduced herbicide use at 25.7% leads mechanical brush control at 20%. The other practices follow the pattern described above.

The results of respondents being asked about profitability and the ease of obtaining information on these practices are presented in Tables C-2-46 and C-2-47. With the exception of riparian area management, where 63.9% gave a "Don't Know" answer, there is a substantial number saying that each practice would increase profitability. Approximately 75% held the same assessment for soil testing (76.2%), prescribed burning (75.7%), and mechanical brush control (73.7%). Split application of N (52.4%) and reduced herbicide use (48.6%) are close behind. However, for riparian area management and to a lesser degree split application, 63.9 and 40.9% respectively have no assessment on profitability.

A majority of all respondents said that obtaining information on these systems was either easy or somewhat easy. While there was a sizable number not knowing about obtaining information, especially riparian area management with 55.9%; very few said it was not easy.

<u>Current Behavior</u>. Table C-2-48 presents the claimed adoption relative to five of the six practices in the Texas Demonstration area only. There were 68.2% saying they already use soil testing, 57.1% saying they use riparian area management, 43.8% saying they use mechanical brush control, 33.3% claiming to use prescribed burning, and 13.6% split applying nitrogen.

Additional analyses are underway.

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SECTION 7. TABLES

Note: The sizes of demonstration area, comparison area, and combined samples in the following tables are"

	Demonstration	Comparison	Combined
Maryland	64	73	137
Minnesota	84	25	109
Nebraska	119	29	148
Wisconsin	82	143	225
California	65	__	65
Florida	66	15	81
North Carolina	71	29	100
Texas	42	50	92

Table 5b1. Water quality information exposure and sources by sites.

Exposure to water quality information	MD	MN	NE	WI	CA	FL	NC	TX
None	2%	0%	0%	1%	6%	3%	2%	6%
A little	10	16	7	9	22	17	10	10
Some	32	23	27	31	48	22	19	26
Fair amount	38	45	51	46	23	42	53	35
Great deal	18	16	16	13	0	16	16	23
Mean:	3.6	3.6	3.8	3.6	3.9	3.5	3.7	3.6
Water quality information sources (Mean)								
Gov't/Univ.	3.5	3.1	3.3	3.3	3.4	3.5	3.7	2.9
Commercial	2.3	2.3	3.0	2.3	2.7	2.6	2.5	1.9
Farm media	3.6	3.7	3.8	3.7	3.5	3.4	3.5	3.3
General news media	2.6	2.7	3.0	2.7	2.7	2.6	2.8	3.0
Conversations	2.9	2.9	3.1	2.7	3.5	3.1	3.0	3.1

Table 5b2. Water quality information orientations by sites.

Attention to water quality information	MD	MN	NE	WI	CA	FL	NC	TX
None	1%	1%	1%	0%	3%	1%	1%	3%
A little	7	3	3	6	11	3	4	3
Some	21	22	14	23	41	10	16	21
Fair amount	46	46	59	55	45	43	47	46
Great deal	25	28	23	17	0	43	32	27
Mean:	3.9	3.9	4.0	3.8	4.3	4.3	4.1	3.9
Need for more water quality information								
None	7%	6%	3%	3%	8%	4%	4%	12%
A little	24	21	22	16	8	12	16	15
Somewhat	29	26	28	37	25	25	25	24
Fair amount	29	33	34	35	34	33	31	34
Great deal	10	15	13	9	25	26	24	15
Mean:	3.1	3.3	3.3	3.3	3.6	3.7	3.6	3.3
Seeking more water quality information								
None	15%	10%	12%	10%	6%	7%	6%	25%
A little	23	30	26	23	22	12	21	21
Somewhat	23	32	26	30	19	31	24	25
Fair amount	29	23	30	33	45	36	40	21
Great deal	11	5	5	4	8	14	9	8
Mean:	3.0	2.8	2.9	3.0	3.3	3.4	3.3	2.6

Table 5b3. Water quality discussion, information conflict by site.

Frequency of discussion about water quality	MD	MN	NE	WI	CA	FL	NC	TX
Never	5%	7%	5%	7%	3%	6%	5%	13%
Seldom	33	35	17	35	13	26	23	34
Sometimes	42	42	51	44	41	35	51	36
Frequently	18	15	22	12	39	24	18	13
Great deal	2	1	5	2	8	10	3	3
Mean:	2.8	2.7	3.0	2.7	3.3	3.0	2.9	2.6
Frequency of discussion about regulation								
Never	3%	3%	1%	4%	0%	4%	4%	0%
Seldom	18	15	6	17	3	10	20	19
Sometimes	41	37	34	49	3	12	38	29
Frequently	28	37	44	24	31	36	22	33
Great deal	10	8	15	6	64	38	16	20
Mean:	3.2	3.3	3.7	3.1	4.5	4.0	3.3	3.5
Frequency of getting conflicting information								
Never	12%	10%	4%	13%	5%	11%	16%	24%
Seldom	38	36	32	32	30	22	34	21
Sometimes	34	34	45	38	48	37	33	32
Frequently	10	14	14	15	14	26	17	22
Great deal	6	6	5	2	3	4	0	2
Mean:	2.6	2.7	2.8	2.6	2.8	2.9	2.5	2.6

Table 5b4. Water pollution problem perceptions by sites.

Extent of water problem in: (Means)	MD	MN	NE	WI	CA	FL	NC	TX
Nation as a whole	3.9	3.9	3.7	3.6	3.1	3.7	3.8	3.8
State	3.8	3.3	3.0	3.1	2.9	3.5	3.4	3.2
County	3.2	2.6	2.6	2.8	2.1	3.0	3.2	2.4
Own farm	2.2	1.8	1.9	1.9	1.6	1.7	1.8	1.5
Impact of farmers on water pollution in: (Means)								
Nation as a whole	2.8	2.5	2.4	2.6	2.3	2.5	2.7	2.3
State	3.0	2.7	2.9	2.8	2.5	2.7	3.0	2.5
County	3.0	2.7	3.0	2.9	2.5	2.7	3.1	2.6
Own farm	2.7	2.9	3.2	2.8	2.5	2.4	3.0	2.3

Table 5b5. Attitudes about water quality by site.

Attitudes:	MD	MN	NE	WI	CA	FL	NC	TX
My farm practices have no impact on water quality								
Strongly disagree	14%	7%	12%	15%	9%	4%	6%	7%
Disagree	23	12	22	26	12	11	20	10
Neither agree/disagree	20	18	28	22	19	21	17	12
Agree	35	39	27	28	43	32	37	35
Strongly agree	8	24	12	9	17	32	20	36
Mean:	3.0	3.6	3.0	2.9	3.5	3.8	3.4	3.8
Farm practices are available to help protect water quality								
Strongly disagree	2%	3%	1%	2%	2%	3%	3%	5%
Disagree	5	5	3	10	3	10	6	8
Neither agree/disagree	13	22	15	20	11	17	9	20
Agree	61	54	64	60	60	53	67	52
Strongly agree	19	16	18	9	25	19	15	16
Mean:	3.9	3.8	4.0	3.6	4.0	3.7	3.8	3.7
I feel great responsibility to help protect water quality								
Strongly disagree	1%	2%	0%	0%	0%	0%	0%	0%
Disagree	1	1	0	2	2	1	1	2
Neither agree/disagree	12	7	8	10	5	9	1	5
Agree	60	52	49	61	52	41	46	44
Strongly agree	27	39	43	27	42	49	52	49
Mean:	4.1	4.3	4.3	4.1	4.3	4.4	4.5	4.4

Table 5b5. (con't)

Attitudes:	MD	MN	NE	WI	CA	FL	NC	TX
Definite possibility of problem on my own land								
Strongly disagree	28%	40%	29%	27%	54%	51%	30%	57%
Disagree	40	45	46	44	40	40	46	33
Neither agree/disagree	23	9	17	18	6	8	16	7
Agree	8	3	7	8	0	1	7	3
Strongly agree	1	2	2	3	0	0	1	0
Mean:	2.1	1.8	2.1	2.1	1.5	1.6	2.0	1.6
If I don't act on water quality, government will force me to								
Strongly disagree	6%	7%	4%	7%	5%	4%	5%	14%
Disagree	8	6	3	8	5	8	8	2
Neither agree/disagree	18	15	10	19	8	15	20	17
Agree	46	51	55	47	41	40	41	41
Strongly agree	23	22	28	20	42	33	26	25
Mean:	3.7	4.0	4.0	3.7	4.1	3.9	3.7	3.6

Table 5b6. Information sources for farm operation decisions by site.

Frequency of use of sources: (Means)	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers	3.4	3.1	3.1	3.2	3.0	2.8	3.1	3.0
Farm newspapers	3.6	3.3	3.2	3.7	3.4	3.3	3.4	3.0
General farm magazines	3.5	3.6	3.5	3.6	3.2	3.3	3.5	3.0
Specialized farm magazines	2.9	2.6	2.7	2.9	3.4	3.9	2.7	2.2
Extension publication	3.2	3.0	2.9	3.1	3.5	3.7	3.5	3.0
USDA demonstration publ.	2.6	1.7	2.2	2.4	3.1	1.9	1.7	1.9
Private newsletters	1.8	1.7	2.5	1.8	2.3	1.6	1.9	1.6
General TV/radio news	2.6	3.0	3.2	3.1	2.9	3.0	3.1	2.9
TV farm programs	2.1	2.5	2.8	2.8	2.3	2.1	3.1	2.3
Radio farm programs	2.1	2.9	3.3	2.8	2.3	2.0	2.6	2.8
Farm meetings, workshops	2.6	2.6	3.0	2.7	3.4	3.2	2.9	2.2
Demonstrations/field day	2.7	2.6	3.0	2.7	3.3	2.9	2.5	2.3
USDA demonstrations	2.1	1.6	2.1	1.8	2.9	1.6	1.6	1.7
Commercial dealers, etc.	2.8	3.2	3.5	3.1	3.4	2.9	3.2	2.7
Independent consultants	1.8	1.8	3.0	2.2	2.1	2.5	1.9	1.6
Ext./univ. agents	2.9	2.8	2.8	2.8	3.4	3.3	3.2	2.8
Soil/water cons. agents	3.0	2.7	2.6	2.8	2.8	3.1	3.2	2.8
Farm lenders	1.6	1.8	2.4	1.8	2.1	1.5	2.0	1.5
Landlords/tenants	1.7	1.4	2.6	1.6	2.5	1.6	1.9	1.5
Family members/partners	2.8	2.9	3.2	2.8	3.2	2.7	2.8	2.7
Other farmers	2.8	3.0	3.1	2.8	3.3	3.1	2.6	3.1

Table 5b7. Most useful sources for day-to-day decisions by site.

Most useful source for day-to-day decisions	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers	5%	4%	5%	3%	6%	5%	16%	8%
Farm newspapers	7	10	4	20	0	2	4	4
General farm magazines	27	14	9	11	4	5	12	17
Specialized farm magazines	3	1	2	1	0	15	3	0
Extension publication	8	1	2	2	9	14	5	7
USDA demonstration publ.	0	1	0	0	0	0	0	3
Private newsletters	2	3	3	1	2	0	0	0
General TV/radio news	3	1	5	6	0	3	5	13
TV farm programs	1	2	1	4	0	0	5	0
Radio farm programs	0	10	10	5	0	0	0	6
Farm meetings, workshops	3	7	2	4	2	2	1	3
Demonstrations/field day	1	1	1	0	2	2	1	3
USDA demonstrations	0	0	0	0	0	0	0	0
Commercial dealers, etc.	14	17	14	17	25	2	11	4
Independent consultants	1	2	17	6	0	8	3	0
Ext./univ. agents	8	2	2	4	4	21	11	1
Soil/water cons. agents	2	2	0	0	0	0	3	1
Farm lenders	0	0	2	0	0	0	0	0
Landlords/tenants	1	0	0	1	0	0	0	1
Family members/partners	15	14	20	13	18	12	16	10
Other farmers	3	7	4	5	27	12	5	19

Table 5b8. Most useful source for long-range production, marketing by site.

Most useful source for long-range production, marketing	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers	3%	2%	1%	4%	4%	3%	3%	6%
Farm newspapers	5	7	2	18	7	3	11	5
General farm magazines	26	25	18	17	9	5	21	21
Specialized farm magazines	7	3	1	7	13	27	3	3
Extension publication	8	1	0	1	0	9	1	6
USDA demonstration publ.	0	0	0	1	0	0	0	2
Private newsletter	5	8	20	3	4	3	4	2
General TV/radio news	4	1	5	2	0	0	5	6
TV farm programs	1	1	0	3	4	0	5	2
Radio farm programs	0	7	8	3	0	2	0	6
Farm meetings, workshops	4	5	4	7	4	0	4	0
Demonstrations/field day	0	0	1	0	0	2	0	2
USDA demonstrations	0	0	0	0	0	0	1	0
Commercial dealers, etc.	10	12	6	9	19	6	7	6
Independent consultants	4	5	11	7	2	3	4	3
Ext./univ. agents	7	3	2	8	4	14	11	9
Soil/water cons. agents	2	2	0	1	0	3	5	5
Farm lenders	1	2	9	1	0	0	1	2
Landlords/tenants	0	0	1	0	0	0	0	2
Family members/partners	12	14	10	9	20	14	12	3
Other farmers	2	2	3	2	11	8	1	12

Table 5b9. Most useful source for first hearing about new practices by site.

Most useful source for first hearing about new farm practices	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers	2%	2%	2%	3%	4%	2%	9%	7%
Farm newspapers	10	9	3	24	7	2	5	9
General farm magazines	41	46	56	26	18	9	20	27
Specialized farm magazines	5	5	2	5	7	29	5	1
Extension publication	9	4	1	6	12	10	11	13
USDA demonstration publ.	1	0	0	1	0	0	0	1
Private newsletters	1	2	0	0	0	0	1	0
General TV/radio news	1	4	1	2	0	2	4	4
TV farm programs	2	0	2	4	2	2	4	3
Radio farm programs	1	4	12	5	0	0	0	7
Farm meetings, workshops	3	3	4	3	7	7	8	0
Demonstrations/field day	5	6	7	2	5	4	3	3
USDA demonstrations	1	0	0	0	0	0	0	0
Commercial dealers, etc.	8	4	2	5	7	9	6	3
Independent consultants	0	1	2	3	0	0	1	0
Ext./univ. agents	6	2	2	8	14	18	17	6
Soil/water cons. agents	3	1	0	1	0	0	0	3
Farm lenders	0	0	0	0	0	0	0	0
Landlords/tenants	0	0	0	1	0	0	0	0
Family members/partners	0	0	1	0	2	0	4	1
Other farmers	3	5	2	4	16	7	3	11

Table 5b10. Most useful source for evaluating new practices by site.

Most useful source for evaluating new practices	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers	0%	0%	0%	1%	0%	0%	1%	2%
Farm newspapers	3	4	2	8	0	0	5	3
General farm magazines	15	18	17	17	4	4	9	13
Specialized farm magazines	5	6	2	2	4	7	5	2
Extension publication	15	4	2	7	11	10	13	13
USDA demonstration publ.	0	1	0	0	0	0	0	2
Private newsletters	1	0	2	1	0	0	1	3
General TV/radio news	2	1	1	2	0	0	0	0
TV farm programs	0	1	0	3	0	0	1	2
Radio farm programs	0	2	1	1	0	0	0	0
Farm meetings, workshops	10	2	5	2	7	4	4	3
Demonstrations/field day	11	11	17	16	7	4	8	13
USDA demonstrations	1	0	0	1	0	0	1	2
Commercial dealers, etc.	7	11	5	4	7	4	1	6
Independent consultants	1	1	12	4	0	3	3	2
Ext./univ. agents	7	7	4	9	16	27	23	8
Soil/water cons. agents	4	2	0	1	0	3	4	3
Farm lenders	0	0	0	0	0	0	0	0
Landlords/tenants	1	0	0	1	2	0	0	0
Family members/partners	5	5	6	6	7	3	13	2
Other farmers	13	21	27	15	35	29	7	25

Table 5b11. Most useful source for learning how to try new practices by site.

Most useful source for learning how to try new practices	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers	0%	1%	0%	1%	0%	0%	0%	0%
Farm newspapers	1	0	2	7	2	0	4	2
General farm magazines	15	20	19	12	0	3	12	14
Specialized farm magazines	6	2	2	2	0	9	1	0
Extension publication	10	5	2	9	9	6	10	13
USDA demonstration publ.	0	0	0	0	0	0	0	3
Private newsletters	1	0	0	0	0	0	0	0
General TV/radio news	1	0	1	1	0	0	0	0
TV farm programs	0	0	0	1	0	0	1	0
Radio farm programs	1	2	1	0	0	0	0	0
Farm meetings, workshops	9	7	5	9	6	3	8	3
Demonstrations/field day	11	11	23	13	18	9	7	19
USDA demonstrations	1	0	0	1	0	0	1	3
Commercial dealers, etc.	14	15	10	15	9	12	13	3
Independent consultants	1	0	9	5	2	6	1	2
Ext./univ. agents	10	6	2	12	18	34	23	9
Soil/water cons. agents	7	2	0	1	0	0	1	2
Farm lenders	0	0	0	0	0	0	0	0
Landlords/tenants	1	0	0	0	2	0	0	0
Family members/partners	1	3	3	2	2	0	7	3
Other farmers	11	25	21	10	31	18	10	25

Table 5b12. Most useful source for choosing nutrient/pest BMPs by site.

Most useful source for choosing nutrient/pest BMP	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers	1%	0%	0%	1%	0%	0%	0%	2%
Farm newspapers	4	1	0	2	0	0	3	3
General farm magazines	5	11	3	5	0	0	1	3
Specialized farm magazines	4	5	7	3	2	8	3	2
Extension publication	12	6	2	6	14	13	11	15
USDA demonstration publ.	2	0	0	0	0	0	0	0
Private newsletters	0	0	0	1	0	0	0	0
General TV/radio news	1	0	1	1	0	0	0	0
TV farm programs	0	0	1	1	0	0	0	0
Radio farm programs	0	2	0	0	0	0	0	2
Farm meetings, workshops	3	6	2	4	2	3	3	2
Demonstrations/field day	1	3	2	1	0	3	1	5
USDA demonstrations	1	0	0	0	0	0	1	0
Commercial dealers, etc.	44	46	33	50	57	24	34	31
Independent consultants	4	4	44	15	12	10	5	5
Ext./univ. agents	14	9	4	6	9	28	28	21
Soil/water cons. agents	2	0	0	1	0	0	6	2
Farm lenders	0	0	0	0	0	0	0	0
Landlords/tenants	0	0	0	0	0	0	1	0
Family members/partners	0	2	1	1	2	2	3	2
Other farmers	3	4	2	2	3	9	1	8

Table 5b13. Most useful source for choosing best manure BMP by site.

Most useful source for choosing best manure BMP	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers	2%	0%	0%	1%	NA	3%	0%	2%
Farm newspapers	1	0	3	7	NA	0	1	0
General farm magazines	13	19	15	8	NA	6	4	18
Specialized farm magazines	1	6	7	1	NA	14	0	0
Extension publication	10	7	7	10	NA	8	10	11
USDA demonstration publ.	2	1	1	2	NA	0	0	2
Private newsletters	0	0	0	0	NA	0	1	0
General TV/radio news	1	0	2	1	NA	0	0	0
TV farm programs	1	0	0	0	NA	0	0	2
Radio farm programs	0	4	0	0	NA	0	0	0
Farm meetings, workshops	3	4	3	6	NA	3	6	7
Demonstrations/field day	2	3	2	2	NA	0	1	5
USDA demonstrations	4	0	1	2	NA	3	1	0
Commercial dealers, etc.	3	4	4	7	NA	3	8	7
Independent consultants	0	4	18	6	NA	8	4	0
Ext./univ. agents	23	17	18	23	NA	36	35	11
Soil/water cons. agents	24	6	2	8	NA	0	15	11
Farm lenders	0	1	0	0	NA	0	0	0
Landlords/tenants	0	0	0	1	NA	0	1	0
Family members/partners	6	13	7	8	NA	3	4	4
Other farmers	5	10	8	7	NA	14	8	18

Table 5b14. Most useful source for finding out about community water problems by site.

Most useful source for finding out about community water problems	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers	20%	9%	12%	10%	24%	15%	8%	29%
Farm newspapers	3	1	1	3	6	0	0	0
General farm magazines	3	1	3	2	0	0	1	2
Specialized farm magazines	0	0	0	1	0	2	0	0
Extension publication	13	14	8	12	15	9	16	2
USDA demonstration publ.	9	1	1	7	6	5	0	12
Private newsletters	0	0	0	1	2	0	0	2
General TV/radio news	4	9	6	6	2	6	0	5
TV farm programs	0	2	1	1	0	3	0	0
Radio farm programs	3	8	2	2	0	0	0	0
Farm meetings, workshops	3	2	1	3	0	9	7	2
Demonstrations/field day	0	0	2	1	9	5	3	0
USDA demonstrations	3	1	0	6	0	2	0	5
Commercial dealers, etc.	0	1	0	1	0	0	1	0
Independent consultants	1	4	8	3	0	3	0	0
Ext./univ. agents	17	20	19	16	19	23	22	5
Soil/water cons. agents	20	27	35	24	17	17	43	21
Farm lenders	0	0	0	0	0	0	0	0
Landlords/tenants	0	0	0	0	0	0	0	0
Family members/partners	2	0	0	1	0	0	0	5
Other farmers	3	5	3	4	2	3	0	14

Table 5b15. Water quality information exposure and sources by demonstration sites.

Exposure to water quality information	MD	MN	NE	WI	CA	FL	NC	TX
None	2%	0%	0%	0%	6%	3%	1%	8%
A little	6	16	8	1	22	15	9	3
Some	35	23	31	31	48	24	20	21
Fair amount	33	46	49	48	23	44	54	44
Great deal	24	16	13	11	0	14	17	26
Mean:	3.7	3.6	3.7	3.6	3.9	3.5	3.8	3.8
Water quality information sources (Mean)								
Gov't/Univ.	3.4	3.0	3.2	3.2	3.4	3.4	3.8	3.0
Commercial	2.3	2.4	2.9	2.4	2.7	2.6	2.5	2.1
Farm media	3.6	3.7	3.7	3.7	3.5	3.5	3.6	3.4
General news media	2.7	2.6	2.9	2.8	2.7	2.6	2.8	3.0
Conversations	3.0	2.8	3.1	2.7	3.5	3.0	3.0	2.9

Table 5b16. Water quality information orientations by demonstration sites.

Attention to water quality information	MD	MN	NE	WI	CA	FL	NC	TX
None	0%	1%	0%	0%	3%	2%	0%	2%
A little	9	4	4	7	11	3	4	5
Some	20	24	17	25	41	11	21	19
Fair amount	44	46	54	53	45	42	44	41
Great deal	27	25	25	15	0	42	31	33
Mean:	3.9	3.9	4.0	3.8	4.3	4.2	4.0	4.0
Need for more water quality information								
None	11%	6%	3%	0%	8%	6%	3%	7%
A little	23	19	24	21	8	14	18	17
Somewhat	27	27	27	32	25	24	25	19
Fair amount	30	31	33	42	34	35	35	33
Great deal	9	17	14	5	25	23	18	24
Mean:	3.0	3.3	3.3	3.3	3.6	3.6	3.5	3.5
Seeking more water quality information								
None	13%	11%	13%	7%	6%	9%	4%	24%
A little	23	29	27	30	22	14	18	20
Somewhat	17	34	25	26	19	29	27	22
Fair amount	38	23	28	36	45	36	41	20
Great deal	9	4	7	1	8	12	10	15
Mean:	3.1	2.8	2.9	2.9	3.3	3.3	3.3	2.8

Table 5b17. Water quality discussion, information conflict by demonstration site.

	MD	MN	NE	WI	CA	FL	NC	TX
Frequency of discussion about water quality								
Never	6%	8%	5%	7%	3%	6%	7%	12%
Seldom	34	38	21	34	13	26	21	36
Sometimes	41	42	47	43	41	33	48	29
Frequently	17	11	21	13	39	26	21	19
Great deal	2	1	6	2	8	9	3	5
Mean:	2.7	2.6	3.0	2.7	3.3	3.0	2.9	2.7
Frequency of discussion about regulation								
Never	3%	4%	2%	6%	0%	5%	6%	0%
Seldom	18	14	6	17	3	12	17	17
Sometimes	41	37	33	46	3	11	44	33
Frequently	30	37	48	26	31	35	18	36
Great deal	8	8	12	5	64	38	16	14
Mean:	3.2	3.3	3.6	3.1	4.5	3.9	3.2	3.5
Frequency of getting conflicting information								
Never	9%	13%	4%	12%	5%	9%	17%	21%
Seldom	41	35	32	32	30	23	34	17
Sometimes	33	36	42	43	48	39	32	38
Frequently	11	11	15	10	14	26	17	21
Great deal	6	5	7	3	3	3	0	2
Mean:	2.6	2.6	2.9	2.6	2.8	2.9	2.5	2.7

Table 5b18. Water pollution problem perceptions by demonstration sites.

Extent of water problem in: (Means)	MD	MN	NE	WI	CA	FL	NC	TX
Nation as a whole	4.0	3.9	3.7	3.6	3.1	3.6	3.8	3.9
State	4.0	3.3	3.0	3.2	2.9	3.3	3.5	3.3
County	3.3	2.7	2.6	3.0	2.1	2.8	3.2	2.3
Own farm	2.2	1.9	1.9	2.0	1.6	1.6	1.9	1.6
Impact of farmers on water pollution in: (Means)								
Nation as a whole	2.8	2.5	2.4	2.7	2.3	2.3	2.8	2.4
State	3.0	2.6	2.9	2.9	2.5	2.6	3.0	2.6
County	3.0	2.7	3.0	2.8	2.5	2.6	3.2	2.7
Own farm	2.9	2.8	3.2	2.7	2.5	2.2	2.8	2.6

Table 5b19. Attitudes about water quality by demonstration site.

Attitudes:	MD	MN	NE	WI	CA	FL	NC	TX
My farm practices have no impact on water quality								
Strongly disagree	13%	7%	13%	11%	9%	3%	5%	10%
Disagree	19	11	22	31	12	8	18	14
Neither agree/disagree	21	22	27	22	19	21	19	17
Agree	40	37	26	31	43	32	39	29
Strongly agree	8	23	13	6	17	36	19	31
Mean:	3.1	3.6	3.0	2.9	3.5	3.9	3.5	3.6
Farm practices are available to help protect water quality								
Strongly disagree	2%	4%	1%	3%	2%	2%	3%	2%
Disagree	5	5	3	11	3	11	6	5
Neither agree/disagree	16	24	15	21	11	14	7	24
Agree	56	54	63	56	60	51	69	54
Strongly agree	22	13	19	10	25	22	15	15
Mean:	3.9	3.7	4.0	3.6	4.0	3.8	3.9	3.7
I feel great responsibility to help protect water quality								
Strongly disagree	2%	1%	0%	0%	0%	0%	0%	0%
Disagree	2	1	0	0	2	2	0	2
Neither agree/disagree	11	8	9	9	5	11	1	0
Agree	58	52	48	63	52	35	45	51
Strongly agree	28	37	43	28	42	52	54	46
Mean:	4.1	4.2	4.3	4.2	4.3	3.4	4.5	4.4

Table 5b19. (con't)

Attitudes:	MD	MN	NE	WI	CA	FL	NC	TX
Definite possibility of problem on my own land								
Strongly disagree	27%	39%	31%	28%	54%	51%	28%	49%
Disagree	40	47	44	46	40	41	46	39
Neither agree/disagree	23	11	18	16	6	6	13	10
Agree	8	1	5	7	0	2	10	2
Strongly agree	2	2	3	3	0	0	2	0
Mean:	2.2	1.8	2.1	2.1	1.5	1.6	2.1	1.7
If I don't act on water quality, government will force me to								
Strongly disagree	8%	7%	4%	5%	5%	5%	4%	15%
Disagree	6	7	3	10	5	6	7	3
Neither agree/disagree	16	16	10	21	8	10	21	18
Agree	43	49	53	46	41	43	43	35
Strongly agree	27	21	29	19	42	37	25	30
Mean:	3.7	3.7	4.0	3.6	4.1	4.0	3.8	3.6

Table 5b20. Information sources for farm operation decisions by site.

Frequency of use of sources: (Means)	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers	3.4	3.1	3.0	3.3	3.0	2.6	3.2	3.1
Farm newspapers	3.4	3.2	3.2	3.7	3.4	3.2	3.6	3.0
General farm magazines	3.5	3.6	3.5	3.6	3.2	3.3	3.7	3.0
Specialized farm magazines	3.0	2.7	2.7	2.9	3.4	3.9	2.9	2.3
Extension publication	3.2	3.0	2.9	3.2	3.5	3.6	3.6	3.2
USDA demonstration publ.	2.9	1.9	2.2	3.0	3.1	2.0	1.8	2.6
Private newsletters	1.8	1.8	2.5	2.0	2.3	1.6	2.0	1.6
General TV/radio news	2.8	2.9	3.0	3.2	2.9	2.8	3.2	2.9
TV farm programs	2.1	2.4	2.7	2.9	2.3	2.2	3.3	2.2
Radio farm programs	2.0	2.8	3.1	2.8	2.3	2.0	2.7	2.7
Farm meetings, workshops	2.8	2.7	3.0	2.6	3.4	3.1	2.9	2.3
Demonstrations/field day	2.7	2.7	3.0	2.7	3.3	2.9	2.5	2.5
USDA demonstrations	2.2	1.7	2.1	2.2	2.9	1.8	1.7	2.1
Commercial dealers, etc.	2.8	3.2	3.5	3.0	3.4	2.8	3.1	2.9
Independent consultants	1.8	1.9	3.0	2.2	2.1	2.3	2.0	1.7
Ext./univ. agents	2.7	2.7	2.8	2.7	3.4	3.2	3.3	2.7
Soil/water cons. agents	2.8	2.5	2.6	2.7	2.8	3.2	3.2	2.9
Farm lenders	1.6	1.8	2.3	1.8	2.1	1.5	1.9	1.6
Landlords/tenants	1.8	1.5	2.6	1.7	2.5	1.5	1.9	1.6
Family members/partners	2.8	2.9	3.2	2.6	3.2	2.7	2.8	2.6
Other farmers	2.8	3.0	3.1	2.9	3.3	3.2	2.6	3.0

Table 5b21. Most useful sources for day-to-day decisions by demonstration site.

Most useful source for day-to-day decisions	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers	7%	6%	4%	3%	6%	4%	19%	9%
Farm newspapers	9	7	4	22	0	2	4	3
General farm magazines	22	16	11	10	4	6	16	20
Specialized farm magazines	7	0	2	0	0	18	4	0
Extension publication	7	1	2	0	9	9	7	6
USDA demonstration publ.	0	1	0	0	0	0	0	3
Private newsletters	2	4	2	1	2	0	0	0
General TV/radio news	2	0	5	6	0	4	7	17
TV farm programs	0	1	1	4	0	0	5	0
Radio farm programs	0	9	7	6	0	0	0	6
Farm meetings, workshops	2	7	2	8	2	2	0	3
Demonstrations/field day	0	1	1	0	2	2	2	6
USDA demonstrations	0	0	0	0	0	0	0	0
Commercial dealers, etc.	13	20	17	15	25	2	5	3
Independent consultants	2	1	15	1	0	4	4	0
Ext./univ. agents	2	3	3	7	4	22	9	3
Soil/water cons. agents	2	1	0	0	0	0	2	3
Farm lenders	0	0	1	0	0	0	0	0
Landlords/tenants	2	0	0	0	0	0	0	3
Family members/partners	17	14	20	12	18	13	12	3
Other farmers	4	6	5	6	27	15	5	14

Table 5b22. Most useful source for long-range production, marketing by demonstration site.

Most useful source for long-range production, marketing	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers	2%	3%	1%	1%	4%	2%	3%	6%
Farm newspapers	8	4	2	22	7	4	10	6
General farm magazines	25	27	18	17	9	6	22	25
Specialized farm magazines	11	3	1	7	13	29	2	6
Extension publication	2	0	0	0	0	7	2	0
USDA demonstration publ.	0	0	0	1	0	0	0	3
Private newsletter	6	8	19	1	4	4	5	0
General TV/radio news	6	0	5	1	0	0	7	6
TV farm programs	0	0	0	3	4	0	7	3
Radio farm programs	0	7	7	4	0	2	0	13
Farm meetings, workshops	2	4	4	6	4	0	5	0
Demonstrations/field day	0	0	1	0	0	0	0	0
USDA demonstrations	0	0	0	0	0	0	2	0
Commercial dealers, etc.	11	14	6	10	19	6	5	6
Independent consultants	4	7	11	4	2	4	3	3
Ext./univ. agents	6	3	2	9	4	13	10	0
Soil/water cons. agents	4	3	0	0	0	4	5	9
Farm lenders	2	1	9	1	0	0	0	0
Landlords/tenants	0	0	1	0	0	0	0	3
Family members/partners	11	14	11	9	20	13	10	3
Other farmers	2	3	4	1	11	9	0	6

Table 5b23. Most useful source for first hearing about new practices by site.

Most useful source for first hearing about new farm practices	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers	4%	1%	3%	3%	4%	2%	10%	6%
Farm newspapers	7	7	3	22	7	2	7	3
General farm magazines	33	47	57	25	18	11	21	32
Specialized farm magazines	9	3	2	6	7	29	2	0
Extension publication	7	4	1	6	12	9	13	24
USDA demonstration publ.	2	0	0	1	0	0	0	3
Private newsletters	2	3	0	0	0	0	2	0
General TV/radio news	0	6	1	1	0	2	5	3
TV farm programs	4	0	2	3	2	2	5	0
Radio farm programs	0	6	8	7	0	0	0	9
Farm meetings, workshops	4	3	5	3	7	7	10	0
Demonstrations/field day	7	8	8	1	5	5	2	6
USDA demonstrations	2	0	0	0	0	0	0	0
Commercial dealers, etc.	6	6	3	6	7	11	3	3
Independent consultants	0	2	2	1	0	0	0	0
Ext./univ. agents	6	3	2	7	14	14	13	3
Soil/water cons. agents	4	0	0	1	0	0	0	3
Farm lenders	0	0	0	0	0	0	0	0
Landlords/tenants	0	0	0	0	0	0	0	0
Family members/partners	0	0	1	0	2	0	5	0
Other farmers	4	4	3	8	16	7	3	6

Table 5b24. Most useful source for evaluating new practices by demonstration site.

Most useful source for evaluating new practices	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers	0%	0%	0%	1%	0%	0%	2%	3%
Farm newspapers	0	6	3	11	0	0	7	3
General farm magazines	17	21	18	21	4	5	12	10
Specialized farm magazines	8	7	1	0	4	9	5	3
Extension publication	13	4	1	4	11	7	13	13
USDA demonstration publ.	0	1	0	0	0	0	0	3
Private newsletters	2	0	2	1	0	0	2	3
General TV/radio news	0	0	1	1	0	0	0	0
TV farm programs	0	0	0	4	0	0	2	3
Radio farm programs	0	3	0	1	0	0	0	0
Farm meetings, workshops	9	3	4	0	7	5	3	3
Demonstrations/field day	13	14	16	16	7	5	5	19
USDA demonstrations	2	0	0	0	0	0	2	3
Commercial dealers, etc.	6	11	6	9	7	5	2	10
Independent consultants	2	1	12	3	0	4	3	0
Ext./univ. agents	6	7	4	7	16	23	20	10
Soil/water cons. agents	6	1	0	0	0	4	5	0
Farm lenders	0	0	0	0	0	0	0	0
Landlords/tenants	2	0	0	0	2	0	0	0
Family members/partners	4	7	6	3	7	4	12	0
Other farmers	11	15	27	16	35	29	7	13

Table 5b25.Most useful source for learning how to try new practices by demonstration site.

Most useful source for learning how to try new practices	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers	0%	0%	0%	0%	0%	0%	0%	0%
Farm newspapers	0	0	2	7	2	0	5	3
General farm magazines	13	25	20	13	0	4	13	16
Specialized farm magazines	9	1	1	3	0	9	0	0
Extension publication	6	7	2	9	9	4	10	6
USDA demonstration publ.	0	0	0	0	0	0	0	6
Private newsletters	2	0	0	0	0	0	0	0
General TV/radio news	0	0	1	0	0	0	0	0
TV Farm programs	0	0	0	2	0	0	2	0
Radio farm programs	0	3	0	0	0	0	0	0
Farm meetings, workshops	11	8	5	10	6	4	8	3
Demonstrations/field day	13	11	22	10	18	11	7	25
USDA demonstrations	0	0	0	2	0	0	2	6
Commercial dealers, etc.	19	15	11	19	9	14	13	3
Independent consultants	0	0	10	6	2	7	2	3
Ext./univ. agents	11	6	3	4	18	32	20	9
Soil/water cons. agents	2	1	0	2	0	0	2	0
Farm lenders	0	0	0	0	0	0	0	0
Landlords/tenants	2	0	0	0	2	0	0	0
Family members/partners	0	4	4	2	2	0	5	3
Other farmers	13	19	21	12	31	16	12	16

Table 5b26. Most useful source for choosing nutrient/pest BMPs by demonstration site.

Most useful source for choosing nutrient/pest BMP	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers	0%	0%	0%	1%	0%	0%	0%	0%
Farm newspapers	6	0	0	1	0	0	3	6
General farm magazines	6	12	4	4	0	0	2	6
Specialized farm magazines	2	6	7	4	2	9	2	0
Extension publication	13	7	1	7	14	9	13	19
USDA demonstration publ.	4	0	0	0	0	0	0	0
Private newsletters	0	0	0	1	0	0	0	0
General TV/radio news	0	0	1	0	0	0	0	0
TV farm programs	0	0	0	0	0	0	0	0
Radio farm programs	0	3	0	0	0	0	0	3
Farm meetings, workshops	2	8	2	6	2	4	2	3
Demonstrations/field day	2	3	1	1	0	2	2	3
USDA demonstrations	0	0	0	0	0	0	2	0
Commercial dealers, etc.	44	41	39	49	57	29	32	38
Independent consultants	6	4	40	14	12	9	3	6
Ext./univ. agents	13	10	3	8	9	29	29	13
Soil/water cons. agents	2	0	0	1	0	0	7	0
Farm lenders	0	0	0	0	0	0	0	0
Landlords/tenants	0	0	0	0	0	0	2	0
Family members/partners	0	3	0	0	2	2	2	0
Other farmers	2	4	3	3	3	9	2	3

Table 5b27. Most useful source for choosing best manure BMP by demonstration site.

	MD	MN	NE	WI	CA	FL	NC	TX
Most useful source for choosing best manure BMP								
General newspapers	0%	0%	0%	0%	NA	3%	0%	0%
Farm newspapers	0	0	1	7	NA	0	2	0
General farm magazines	12	23	16	10	NA	3	3	21
Specialized farm magazines	2	5	8	1	NA	10	0	0
Extension publication	10	7	7	10	NA	7	13	16
USDA demonstration publ.	4	2	1	6	NA	0	0	5
Private newsletters	0	0	0	0	NA	0	2	0
General TV/radio news	0	0	3	0	NA	0	0	0
TV farm programs	0	0	0	0	NA	0	0	5
Radio farm programs	0	5	0	0	NA	0	0	0
Farm meetings, workshops	4	5	1	7	NA	3	5	5
Demonstrations/field day	2	2	3	1	NA	0	2	5
USDA demonstrations	6	0	1	6	NA	3	2	0
Commercial dealers, etc.	4	3	6	3	NA	3	10	11
Independent consultants	0	3	15	4	NA	10	2	0
Ext./univ. agents	18	18	19	25	NA	39	33	16
Soil/water cons. agents	25	5	1	4	NA	0	12	11
Farm lenders	0	0	0	0	NA	0	0	0
Landlords/tenants	0	0	0	1	NA	0	2	0
Family members/partners	6	16	7	6	NA	3	5	0
Other farmers	6	7	10	7	NA	16	8	5

Table 5b28. Most useful source for finding out about community water problems by demonstration site.

Most useful source for finding out about community water problems	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers	17%	10%	14%	7%	24%	18%	8%	27%
Farm newspapers	4	1	1	3	6	0	0	0
General farm magazines	4	1	4	1	0	0	2	3
Specialized farm magazines	0	0	0	1	0	2	0	0
Extension publication	6	15	8	16	15	5	18	0
USDA demonstration publ.	11	1	1	9	6	5	0	18
Private newsletters	0	0	0	0	2	0	0	0
General TV/radio news	4	3	7	4	2	5	0	3
TV farm programs	0	1	1	0	0	4	0	0
Radio farm programs	4	8	1	4	0	0	0	0
Farm meetings, workshops	6	3	0	1	0	9	5	3
Demonstrations/field day	0	0	2	0	9	5	3	0
USDA demonstrations	6	1	0	10	0	2	0	9
Commercial dealers, etc.	0	1	0	1	0	0	0	0
Independent consultants	2	6	6	1	0	4	0	0
Ext./univ. agents	11	18	19	17	19	21	18	3
Soil/water cons. agents	23	25	36	21	17	16	45	21
Farm lenders	0	0	0	0	0	0	0	0
Landlords/tenants	0	0	0	0	0	0	0	0
Family members/partners	2	0	0	0	0	0	0	3
Other farmers	2	4	2	3	2	4	0	9

Table 5b29. Main exposure source for split nitrogen application by demonstration site.

Main source split nitrogen application	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers	2%	0%	0%	0%			1%	
Farm newspapers	2	0	4	6			3	
General farm magazines	17	16	19	11			13	
Specialized farm magazines	6	1	6	2			3	
Extension publication	8	3	7	2			10	
USDA demonstration publ.	2	0	1	3			0	
Private newsletters	0	0	1	0			0	
General TV/radio news	0	0	1	0			3	
TV farm programs	0	0	0	0			0	
Radio farm programs	0	0	2	0			0	
Farm meetings, workshops	0	18	4	14			6	
Demonstrations/field day	4	6	3	2			0	
USDA demonstrations	0	0	1	0			0	
Commercial dealers, etc.	34	29	11	46			20	
Independent consultants	6	3	21	5			0	
Ext./univ. agents	11	8	11	6			13	
Soil/water cons. agents	2	0	1	0			6	
Farm lenders	0	0	0	0			0	
Landlords/tenants	0	0	1	0			0	
Family members/partners	2	7	4	0			11	
Other farmers	6	10	5	3			13	

Table 5b30. Main exposure source for legume crediting by site.

Main source legume crediting	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers	0%	0%	0%	1%				
Farm newspapers	4	1	2	15				
General farm magazines	19	30	24	8				
Specialized farm magazines	6	4	6	1				
Extension publication	17	6	8	4				
USDA demonstration publ.	6	0	2	1				
Private newsletters	0	0	0	1				
General TV/radio news	0	0	1	0				
TV farm programs	0	0	0	0				
Radio farm programs	0	0	1	0				
Farm meetings, workshops	0	14	3	14				
Demonstrations/field day	6	0	1	1				
USDA demonstrations	2	0	0	0				
Commercial dealers, etc.	15	13	11	25				
Independent consultants	4	0	24	10				
Ext./univ. agents	15	14	7	10				
Soil/water cons. agents	2	0	2	1				
Farm lenders	0	0	0	0				
Landlords/tenants	0	0	0	0				
Family members/partners	2	16	8	3				
Other farmers	4	3	1	4				

Table 5b31. Main exposure source about manure crediting by demonstration site.

Main source for manure crediting	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers	0%	0%		1%			3%	
Farm newspapers	12	1		17			4	
General farm magazines	10	29		13			7	
Specialized farm magazines	4	3		1			1	
Extension publication	10	7		3			8	
USDA demonstration publ.	12	1		1			3	
Private newsletters	0	0		0			0	
General TV/radio news	0	0		0			6	
TV farm programs	0	0		0			1	
Radio farm programs	0	0		0			1	
Farm meetings, workshops	2	8		15			4	
Demonstrations/field day	6	1		1			4	
USDA demonstrations	6	1		0			1	
Commercial dealers, etc.	14	4		24			1	
Independent consultants	4	1		8			1	
Ext./univ. agents	12	15		11			30	
Soil/water cons. agents	6	4		0			18	
Farm lenders	0	0		0			1	
Landlords/tenants	0	0		0			0	
Family members/partners	4	13		3			0	
Other farmers	2	10		3			4	

Table 5b32. Main exposure source about irrigation scheduling

Main source irrigation scheduling	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers		0%	1%					
Farm newspapers		0	3					
General farm magazines		16	9					
Specialized farm magazines		5	5					
Extension publication		4	6					
USDA demonstration publ.		4	1					
Private newsletters		0	1					
General TV/radio news		0	0					
TV farm programs		0	0					
Radio farm programs		0	1					
Farm meetings, workshops		21	6					
Demonstrations/field day		7	4					
USDA demonstrations		2	0					
Commercial Dealers		4	2					
Independent consultants		2	23					
Ext./univ. agents		14	23					
Soil/water cons. agents		2	11					
Farm lenders		0	0					
Landlords/tenants		0	0					
Family members/partners		2	5					
Other farmers		18	0					

Table 5b33. Main exposure source for farmstead assessment system by demonstration site.

Main source farmstead assessment	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers				4%				
Farm newspapers				9				
General farm magazines				4				
Specialized farm magazines				0				
Extension publication				13				
USDA demonstration publ.				13				
Private newsletters				4				
General TV/radio news				0				
TV farm programs				0				
Radio farm programs				0				
Farm meetings, workshops				9				
Demonstrations/field day				0				
USDA demonstrations				4				
Commercial Dealers				4				
Independent consultants				0				
Ext./univ. agents				9				
Soil/water cons. agents				13				
Farm lenders				0				
Landlords/tenants				0				
Family members/partners				0				
Other farmers				13				

Table 5b34. Main exposure source about float valve rice boxes by demo. site.

Main source float valve rice boxes	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers					0%			
Farm newspapers					4			
General farm magazines					4			
Specialized farm magazines					6			
Extension publication					19			
Rice water quality demo					2			
Private newsletters					0			
General TV/radio news					0			
TV farm programs					0			
Radio farm programs					0			
Farm or ranch meetings					2			
Farm or ranch demos					8			
Rice water quality publication					8			
Farm or ranch supply dealers					6			
Independent consultants					0			
Ext./univ. agents					10			
Soil/water cons. agents					10			
Farm lenders					0			
Landlords/tenants					0			
Family members/partners					0			
Other farmers					21			
Water reclamation di					2			

Table 5b35. Main exposure source about water table monitoring by demonstration.

Main source water table monitoring	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers						0%		
Farm newspapers						0		
General farm magazines						0		
Specialized farm magazines						8		
Extension publication						0		
USDA demonstration publ.						0		
Private newsletters						0		
General TV/radio news						8		
TV farm programs						0		
Radio farm programs						0		
Farm meetings, workshops						8		
Demonstrations/field day						8		
USDA demonstrations						0		
Commercial Dealers						0		
Independent consultants						17		
Ext./univ. agents						42		
Soil/water cons. agents						0		
Farm lenders						0		
Landlords/tenants						0		
Family members/partners						8		
Other farmers						0		

Table 5b36. Main exposure source about fully enclosed seep irrigation systems by demonstration.

Main source fully enclosed seep irrigation systems	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers						0%		
Farm newspapers						0		
General farm magazines						0		
Specialized farm magazines						8		
Extension publication						0		
USDA demonstration publ.						0		
Private newsletters						0		
General TV/radio news						0		
TV farm programs						0		
Radio farm programs						0		
Farm meetings, workshops						8		
Demonstrations/field day						8		
USDA demonstrations						0		
Commercial Dealers						8		
Independent consultants						8		
Ext./univ. agents						62		
Soil/water cons. agents						0		
Farm lenders						0		
Landlords/tenants						0		
Family members/partners						0		
Other farmers						0		

Table 5b37. Main exposure source about testing for system uniformity and efficiency

Main source testing for system uniformity and efficiency	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers						0%		
Farm newspapers						3		
General farm magazines						3		
Specialized farm magazines						8		
Extension publication						13		
USDA demonstration publ.						0		
Private newsletters						0		
General TV/radio news						0		
TV farm programs						0		
Radio farm programs						0		
Farm meetings, workshops						3		
Demonstrations/field day						3		
USDA demonstrations						0		
Commercial dealers, etc.						18		
Independent consultants						5		
Ext./univ. agents						15		
Soil/water cons. agents						25		
Farm lenders						0		
Landlords/tenants						3		
Family members/partners						0		
Other farmers						5		

Table 5b38. Main exposure source about soil moisture tests by demo.site.

Main source soil moisture tests	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers						0%		
Farm newspapers						5		
General farm magazines						8		
Specialized farm magazines						13		
Extension publication						11		
USDA demonstration publ.						0		
Private newsletters						5		
General TV/radio news						0		
TV farm programs						0		
Radio farm programs						0		
Farm meetings, workshops						0		
Demonstrations/field day						3		
USDA demonstrations						0		
Commercial dealers, etc.						5		
Independent consultants						5		
Ext./univ. agents						18		
Soil/water cons. agents						16		
Farm lenders						0		
Landlords/tenants						0		
Family members/partners						0		
Other farmers						11		

Table 5b39. Main exposure source about multiple application of nutrients by demo. site.

Main source multiple application of nutrients	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers						0%		
Farm newspapers						5		
General farm magazines						5		
Specialized farm magazines						7		
Extension publication						9		
USDA demonstration publ.						2		
Private newsletters						0		
General TV/radio news						0		
TV farm programs						0		
Radio farm programs						0		
Farm meetings, workshops						7		
Demonstrations/field day						0		
USDA demonstrations						0		
Commercial dealers, etc.						18		
Independent consultants						7		
Ext./univ. agents						21		
Soil/water cons. agents						5		
Farm lenders						0		
Landlords/tenants						0		
Family members/partners						0		
Other farmers						16		

Table 5b40. Main exposure source about improved fertilizer management by demonstration.

Main source improved fertilizer management	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers						0%		
Farm newspapers						0		
General farm magazines						0		
Specialized farm magazines						9		
Extension publication						0		
USDA demonstration publ.						0		
Private newsletters						0		
General TV/radio news						0		
TV farm programs						0		
Radio farm programs						0		
Farm meetings, workshops						0		
Demonstrations/field day						9		
USDA demonstrations						0		
Commercial Dealers						27		
Independent consultants						9		
Ext./univ. agents						36		
Soil/water cons. agents						9		
Farm lenders						0		
Landlords/tenants						0		
Family members/partners						0		
Other farmers						0		

Table 5b41. Main exposure source about poultry composting by demonstration site.

Main source for manure crediting	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers							0%	
Farm newspapers							13	
General farm magazines							0	
Specialized farm magazines							0	
Extension publication							50	
USDA demonstration publ.							0	
Private newsletters							0	
General TV/radio news							0	
TV farm programs							0	
Radio farm programs							0	
Farm meetings, workshops							0	
Demonstrations/field day							0	
USDA demonstrations							13	
Commercial dealers, etc.							0	
Independent consultants							0	
Ext./univ. agents							13	
Soil/water cons. agents							13	
Farm lenders							0	
Landlords/tenants							0	
Family members/partners							0	
Other farmers							0	

Table 5b42. Main exposure source about reduced herbicide use on rangeland by demo. site.

Main source reduced herbicide use on rangeland	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers								6%
Farm newspapers								3
General farm magazines								13
Specialized farm magazines								3
Extension publication								13
USDA demonstration publ.								3
Private newsletters								0
General TV/radio news								0
TV farm programs								0
Radio farm programs								6
Farm meetings, workshops								6
Demonstration/Field day								3
USDA demonstrations								6
Commercial dealers, etc.								6
Independent consultants								0
Ext./univ. agents								9
Soil/water cons. agents								19
Farm lenders								0
Landlords/tenants								0
Family members/partners								0
Other farmers								3

Table 5b43. Main exposure source about riparian area management by demo. site.

Main source riparian area management	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers								0%
Farm newspapers								0
General farm magazines								11
Specialized farm magazines								0
Extension publication								5
USDA demonstration publ.								11
Private newsletters								0
General TV/radio news								5
TV farm programs								0
Radio farm programs								0
Farm meetings, workshops								5
Demonstration/Field day								5
USDA demonstrations								5
Commercial dealers, etc.								5
Independent consultants								0
Ext./univ. agents								5
Soil/water cons. agents								16
Farm lenders								0
Landlords/tenants								0
Family members/partners								11
Other farmers								16

Table 5b44. Main exposure source about prescribed burning by demo. site.

Main source prescribed burning	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers								0%
Farm newspapers								6
General farm magazines								9
Specialized farm magazines								0
Extension publication								9
USDA demonstration publ.								12
Private newsletters								0
General TV/radio news								0
TV farm programs								0
Radio farm programs								3
Farm meetings, workshops								3
Demonstration/Field day								9
USDA demonstrations								6
Commercial dealers, etc.								0
Independent consultants								0
Ext./univ. agents								6
Soil/water cons. agents								9
Farm lenders								0
Landlords/tenants								0
Family members/partners								6
Other farmers								24

Table 5b45. Main exposure source about gravity tailwater recapture system demo.site.

	MD	MN	NE	WI	CA	FL	NC	TX
Main source tailwater recirculation system								
General newspapers					0%			
Farm newspapers					6			
General farm magazines					4			
Specialized farm magazines					4			
Extension publication					15			
Rice water quality demo					2			
Private newsletters					0			
General TV/radio news					0			
TV farm programs					0			
Radio farm programs					0			
Farm or ranch meetings					4			
Farm or ranch demos					6			
Rice water quality publication					2			
Farm or ranch supply dealers					4			
Independent consultants					2			
Ext./univ. agents					15			
Soil/water cons. agents					15			
Farm lenders					0			
Landlords/tenants					0			
Family members/partners					2			
Other farmers					20			

Table 5b46. Main exposure source about static irrigation system by demo. site.

Main source static irrigation system	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers					0%			
Farm newspapers					4			
General farm magazines					2			
Specialized farm magazines					9			
Extension publication					13			
Rice water quality demo					0			
Private newsletters					0			
General TV/radio news					0			
TV farm programs					0			
Radio farm programs					0			
Farm or ranch meetings					2			
Farm or ranch demos					9			
Rice water quality publication					7			
Farm or ranch supply dealers					4			
Independent consultants					0			
Ext./univ. agents					17			
Soil/water cons. agents					9			
Farm lenders					0			
Landlords/tenants					0			
Family members/partners					2			
Other farmers					22			

Table 5b47. Main exposure source about tail water recirculation system by demo. site.

Main source tailwater recirculation system	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers					2%			
Farm newspapers					7			
General farm magazines					0			
Specialized farm magazines					2			
Extension publication					17			
Rice water quality demo					2			
Private newsletters					0			
General TV/radio news					0			
TV farm programs					0			
Radio farm programs					0			
Farm meetings, workshops					0			
Farm or ranch demos					8			
Rice water quality publication					3			
Farm or ranch supply dealers					5			
Independent consultants					2			
Ext./univ. agents					13			
Soil/water cons. agents					15			
Farm lenders					0			
Landlords/tenants					0			
Family members/partners					5			
Other farmers					20			

Table 5b48. Main exposure source about deep soil nitrate testing

Main source deep soil nitrate testing	MD	MN	NE	WI	CA	FL	NC	TX
General newspapers			0%					
Farm newspapers			4					
General farm magazines			8					
Specialized farm magazines			4					
Extension publication			6					
USDA demonstration publ.			0					
Private newsletters			2					
General TV/radio news			0					
TV farm programs			0					
Radio farm programs			1					
Farm meetings, workshops			2					
Demonstrations/field day			1					
USDA demonstrations			1					
Commercial Dealers			13					
Independent consultants			36					
Ext./univ. agents			16					
Soil/water cons. agents			3					
Farm lenders			1					
Landlords/tenants			1					
Family members/partners			2					
Other farmers			1					

Table 5b49. Awareness, information source of USDA water quality project by demonstration site.

	MD	MN	NE	WI	CA	FL	NC	TX
Awareness								
No, can't recall	18%	59%	59%	15%	55%	48%	67%	15%
Yes, aware of it	82%	41%	41%	85%	45%	52%	33%	85%
Where first heard of it:								
General newspapers	12%	9%	28%	0%	0%	10%	0%	27%
Farm newspapers	0	0	4	0	0	3	0	0
General farm magazines	0	3	2	0	0	0	0	0
Specialized farm magazines	0	0	2	0	3	7	5	0
Extension publication	4	24	2	18	31	3	5	3
USDA demonstration publ.	33	3	0	30	3	24	0	29
Private newsletters	0	0	0	0	0	0	0	3
General TV/radio news	2	0	0	0	0	0	0	0
TV farm programs	0	0	2	2	0	0	0	0
Radio farm programs	2	6	2	2	0	0	0	0
Farm meetings, workshops	4	12	0	3	0	3	0	3
Demonstrations/field day	0	0	2	0	10	3	5	9
USDA demonstrations	12	6	11	6	3	0	5	0
Commercial dealers, etc.	0	0	0	0	3	0	0	3
Independent consultants	0	0	2	0	0	0	5	0
Ext./univ. agents	6	18	28	10	35	24	32	0
Soil/water cons. agents	25	9	4	22	3	17	27	12
Farm lenders	0	0	0	0	0	0	0	0
Landlords/tenants	0	0	0	0	0	0	0	0
Family members/partners	0	0	0	2	0	0	5	3
Other farmers	0	9	9	6	7	3	14	9

Table 5b50. Responsiveness to USDA water quality project by demonstration site.

	MD	MN	NE	WI	CA	FL	NC	TX
Aware of demonstrations								
No	14%	24%	17%	10%	13%	37%	38%	15%
Yes	86%	77%	83%	90%	87%	63%	63%	85%
Visited demonstrations								
No	51%	64%	69%	70%	33%	67%	44%	67%
Yes	49%	36%	31%	30%	67%	33%	56%	33%
Influence of project on own operation								
None	28%	41%	46%	22%	16%	38%	42%	50%
A little	28	32	25	27	19	18	4	9
Some	16	12	19	33	45	35	25	18
Fair amount	20	9	8	15	13	9	13	12
Great deal	8	6	2	4	7	0	17	12
Mean:	2.5	2.1	1.9	2.5	2.7	2.1	2.6	2.3

Table C-2-1. Awareness and Level of Familiarity by Practice (percents) -- California

Awareness and Level of Familiarity	Practices			
	Tailwater Recircul.	Tailwater Gravity	Static Pearson	Float valve Rice box
<u>Awareness</u>	(N=65)	(N=65)	(N=65)	(N=65)
Aware of Practice	65.0	76.6	84.6	72.7
Unaware of Practice	35.0	23.1	15.4	27.3
<u>Level of Familiarity Among Those Aware of Practice</u>	(N=65)	(N=50)	(N=55)	(N=46)
Unfamiliar	1.5	4.0	3.6	13.0
Somewhat Familiar	6.2	14.0	20.0	23.9
Familiar	23.1	28.0	34.5	30.4
Mostly Familiar	23.1	22.0	14.5	15.2
Completely Familiar	46.2	32.0	27.3	17.4

Table C-2-2. Perceived Expense and Labor Requirements by Practice (percents) -- California

Expense and Labor Requirements	Practices			
	Tailwater Recircul.	Tailwater Gravity	Static pearson	Float value Rice box
Expense	(N=63)	(N=64)	(N=64)	(N=63)
Don't Know	4.8	25.0	28.1	36.5
No Expense	0.0	1.6	0.0	0.0
Low Expense	6.3	32.8	28.1	22.2
Moderate Expense	47.6	35.9	31.3	30.2
High Expense	41.3	4.7	12.5	11.1
Labor Requirements	(N=62)	(N=62)	(N=62)	(N=62)
Don't Know	17.7	41.9	41.9	51.6
Less Labor	8.1	3.2	3.2	8.1
No Change in Labor	40.3	33.9	35.5	25.8
More Work/Existing Labor	29.0	16.1	19.4	14.5
Hire Additional Labor	4.8	4.8	0.0	0.0

Table C-2-3. Perceived Complexity and Difficulty Attributes by Practice (percents) -- California

Complexity and Difficulty Attributes	Practices			
	Tailwater Recircul.	Tailwater Recapture	Static Pearson	Float Value Rice Box
<u>Complexity</u>	(N=62)	(N=62)	(N=62)	(N=62)
Don't Know	6.5	24.2	21.0	30.6
Not Complex	32.3	27.4	24.2	29.0
Somewhat Complex	27.4	21.0	33.9	21.0
Complex	17.7	19.4	11.3	8.1
Very Complex	16.1	8.1	9.7	11.3
<u>Difficulty</u>	(N=61)	(N=61)	(N=61)	(N=61)
Don't Know	13.1	36.1	36.1	39.3
Not Difficult	47.5	32.8	39.3	37.7
Somewhat Difficult	24.6	24.6	16.4	16.4
Difficult	6.6	4.9	4.9	4.9
Very Difficult	8.2	1.6	3.3	1.6

Table C-2-4. Perceived Practicality and Risk by Practice (percents) -- California

Practicality and Risk Attributes	Practices			
	Tailwater Recircul.	Tailwater Gravity	Static Pearson	Float Value Rice box
<u>Practicality</u>	(N=62)	(N=61)	(N=61)	(N=61)
Don't Know	6.5	27.9	23.1	37.7
Not Practical	17.7	26.2	26.2	14.8
Somewhat Practical	21.0	27.9	26.2	24.6
Practical	27.4	9.8	13.1	18.0
Very Practical	27.4	8.2	8.2	4.9
<u>Risk</u>	(N=59)	(N=58)	(N=58)	(N=58)
Don't Know	18.6	48.3	39.7	48.3
No Risk	32.2	20.7	27.6	27.6
Low Risk	28.8	17.2	12.1	10.3
Medium Risk	16.9	10.3	13.8	10.3
High Risk	3.4	3.4	6.9	3.4

Table C-2-5. Perceived Impact on Water Quality Re Farm and Community by Practice (percents) -- California

Impact on Water Quality	Practices			
	Tailwater Recircul.	Tailwater Gravity	Static Pearson	Float Value Rice box
Farm Level	(N=62)	(N=61)	(N=61)	(N=61)
Don't Know	14.5	36.1	37.7	45.9
Cause More Pollution	3.2	3.3	3.3	1.6
Not Hurt or Help	19.4	23.0	23.0	31.1
Prevent but Not Improve	27.4	18.0	14.8	11.5
Improve Water Quality	35.5	19.7	21.3	9.8
Community Level	(N=63)	(N=62)	(N=62)	(N=62)
Don't Know	12.7	33.9	37.1	43.5
Cause More Pollution	3.2	3.2	00.0	0.0
Not Hurt or Help	15.9	12.9	16.1	22.6
Prevent but Not Improve	23.8	17.7	17.7	11.3
Improve Water Quality	44.4	32.3	29.0	22.6

Table C-2-6. Perceived Impact on Profitability and Ease of Obtaining Information by Practice (percents) -- California

Impact on Profitability and Ease of Obtaining Information	Practices			
	Tailwater Recircul.	Tailwater Gravity	Static Pearson	Float Valve Rice Box
<u>Impact on Profitability</u>	(N=61)	(N=61)	(N=60)	(N=61)
Don't Know	8.2	27.9	36.7	45.9
Decrease Profits	36.1	18.0	20.0	16.4
No Change in Profits	31.1	41.0	36.7	32.8
Increase Profits	24.6	13.1	6.7	4.9
<u>Ease of Obtaining Information</u>	(N=64)	(N=63)	(N=63)	(N=63)
Don't Know	3.1	17.5	20.6	28.6
Not Easy	1.6	1.6	4.8	6.3
Somewhat Easy	31.3	28.6	25.4	20.6
Easy	64.1	52.4	49.2	44.4

Table C-2-7. Irrigation system currently in use for rice water management (percent) -- California

	(N=64)
Hold water in conventional system	46.2
Ponding on set-aside acreage	15.6
Tailwater recirculation	25.0
Static (Pearson) system	4.7
Gravity tailwater recapture	7.8
Other system	4.7

<u>Nature of system if tailwater recirculation is used</u>

	(N=41)
Individual system	63.4
Several neighbor share system	9.8
District-wide system	29.3
Other	7.3

Table C-2-8. Awareness and Level of Familiarity by Practice (percents) -- Maryland

Awareness and Level of Familiarity	Practices		
	Manure Crediting	Legume Crediting	Split N Application
<u>Awareness</u>	(N=134)	(N=134)	(N=133)
Aware of Practice	71.6	77.6	82.0
Unaware of Practice	28.4	22.4	18.0
<u>Level of Familiarity Among Those Aware of Practice</u>	(N=95)	(N=104)	(N=109)
Unfamiliar	10.5	7.7	4.6
Somewhat Familiar	34.7	28.8	22.0
Familiar	26.3	30.8	31.2
Mostly Familiar	15.8	19.2	24.8
Completely Familiar	12.6	13.5	17.4

Table C-2-9. Perceived Expense and Labor Requirements by Practice (percents) -- Maryland

Expense and Labor Requirements	Practices		
	Manure Crediting	Legume Crediting	Split N Application
<u>Expense</u>	(N=130)	(N=129)	(N=129)
Don't Know	30.0	29.5	24.0
No Expense	23.1	21.7	2.3
Low Expense	36.9	37.2	29.5
Moderate Expense	7.7	10.9	34.1
High Expense	2.3	.8	10.1
<u>Labor Requirements</u>	(N=124)	(N=123)	(N=124)
Don't Know	33.1	33.3	25.0
Less Labor	6.5	4.9	0.8
No Change in Labor	44.4	49.6	28.2
More Work/Existing Labor	12.9	12.2	36.3
Hire Additional Labor	3.2	0.0	9.7

Table C-2-10. Perceived Complexity and Difficulty Attributes by Practice (percents) -- Maryland

Complexity and Difficulty Attributes	Practices		
	Manure Crediting	Legume Crediting	Split N Application
<u>Complexity</u>	(N=128)	(N=127)	(N=126)
Don't Know	28.9	29.1	22.2
Not Complex	44.5	44.1	31.7
Somewhat Complex	17.2	19.7	26.2
Complex	6.3	6.3	15.9
Very Complex	3.1	.8	4.0
<u>Difficulty</u>	(N=126)	(N=125)	(N=124)
Don't Know	30.2	29.6	21.8
Not Difficult	46.0	48.0	42.7
Somewhat Difficult	19.0	19.2	25.8
Difficult	3.2	3.2	4.8
Very Difficult	1.6	0.0	4.8

Table C-2-11. Perceived Practicality and Risk by Practice (percents) -- Maryland

Practicality and Risk Attributes	Practices		
	Manure Crediting	Legume Application	Split N Scheduling
<u>Practicality</u>	(N=126)	(N=125)	(N=124)
Don't Know	22.2	24.0	23.4
Not Practical	15.9	7.2	19.4
Somewhat Practical	17.5	21.6	29.0
Practical	22.2	28.0	21.8
Very Practical	22.2	19.2	6.5
<u>Risk</u>	(N=126)	(N=124)	(N=123)
Don't Know	34.9	30.6	26.0
No Risk	38.9	42.7	35.8
Low Risk	21.4	24.2	23.6
Medium Risk	4.0	1.6	13.0
High Risk	.8	.8	1.6

Table C-2-12. Perceived Impact on Water Quality Re Farm and Community by Practice (percents) -- Maryland

Impact on Water Quality	Practices		
	Manure Crediting	Legume Crediting	Split N Application
Farm Level	(N=127)	(N=126)	(N=125)
Don't Know	30.7	29.4	28.8
Cause More Pollution	3.9	0.0	00.0
Not Hurt or Help	21.3	21.4	19.2
Prevent but Not Improve	12.6	19.8	16.8
Improve Water Quality	31.5	29.4	35.2
Community Level	(N=128)	(N=128)	(N=127)
Don't Know	31.3	29.7	30.7
Cause More Pollution	2.3	.8	1.6
Not Hurt or Help	14.1	15.6	12.6
Prevent but Not Improve	14.8	16.4	16.5
Improve Water Quality	37.5	37.5	38.6

Table C-2-13. Perceived Impact on Profitability and Ease of Obtaining Information by Practice (percents) -- Maryland

Impact on Profitability and Ease of Obtaining Information	Practices		
	Manure Crediting	Legume Crediting	Split N Application
Impact on Profitability	(N=129)	(N=129)	(N=128)
Don't Know	24.8	27.9	28.9
Decrease Profits	1.6	2.3	8.6
No Change in Profits	10.1	7.8	15.6
Increase Profits	63.6	61.1	46.9
Ease of Obtaining Information	(N=128)	(N=128)	(N=128)
Don't Know	21.1	21.1	18.8
Not Easy	2.3	3.9	3.9
Somewhat Easy	39.8	40.6	39.1
Easy	36.8	34.4	58.3

Table C-2-14. Percent using best management practices in 1991 -- Maryland

	Manure Crediting	Legume Crediting	Split Application
	(N=122)	(N=127)	(N=128)
Using Practice	36.9	29.9	10.9
Not using Practice	63.1	70.1	89.1

Table C-2-15. Awareness and Level of Familiarity by Practice (percents) -- Nebraska

Awareness and Level of Familiarity	Practices			
	Legume Crediting	Split N Application	Irrigation Scheduling	Deep Soil Nitrate Test
<u>Awareness</u>	(N=148)	(N=141)	(N=148)	(N=148)
Aware of Practice	85.8	95.3	95.9	94.6
Unaware of Practice	14.2	4.7	4.1	5.4
<u>Level of Familiarity Among Those Aware of Practice</u>	(N=148)	(N=141)	(N=141)	(N=140)
Unfamiliar	3.2	1.4	2.1	0.7
Somewhat Familiar	29.4	7.8	16.3	12.9
Familiar	28.6	38.3	27.0	26.4
Mostly Familiar	23.8	27.0	24.8	32.9
Completely Familiar	15.1	25.5	29.8	27.1

Table C-2-16. Perceived Expense and Labor Requirements by Practice (percents) -- Nebraska

Expense and Labor Requirements	Practices			
	Legume Crediting	Split N Application	Irrigation Scheduling	Deep Soil Nitrate Test
<u>Expense</u>	(N=145)	(N=144)	(N=143)	(N=144)
Don't Know	17.9	7.6	8.4	8.3
No Expense	32.4	1.4	10.5	9.0
Low Expense	37.2	26.4	60.8	61.1
Moderate Expense	11.0	47.9	18.9	20.1
High Expense	1.4	16.7	1.4	1.4
<u>Labor Requirements</u>	(N=141)	(N=144)	(N=144)	(N=144)
Don't Know	24.1	4.9	6.9	6.9
Less Labor	5.0	0.7	3.5	2.1
No Change in Labor	55.3	9.0	42.4	59.7
More Work/Existing Labor	8.5	66.7	43.1	23.6
Hire Additional Labor	7.1	18.8	4.2	7.6

Table C-2-17. Perceived Complexity and Difficulty Attributes by Practice (percents) -- Nebraska

Complexity and Difficulty Attributes	Practices			
	Legume Crediting	Split N Application	Irrigation Scheduling	Deep Soil Nitrate Test
<u>Complexity</u>	(N=145)	(N=146)	(N=145)	(N=145)
Don't Know	17.2	5.5	6.2	5.5
Not Complex	48.3	28.8	44.1	64.8
Somewhat Complex	20.7	30.8	33.8	21.4
Complex	4.8	24.7	13.1	6.9
Very Complex	9.0	10.3	2.8	1.4
<u>Difficulty</u>	(N=144)	(N=144)	(N=144)	(N=144)
Don't Know	20.1	5.6	7.6	6.9
Not Difficult	59.0	46.5	53.5	70.1
Somewhat Difficult	15.3	32.6	30.6	19.4
Difficult	2.1	10.4	6.3	0.7
Very Difficult	3.5	4.9	2.1	2.8

Table C-2-18. Perceived Practicality and Risk by Practice (percents) -- Nebraska

Practicality and Risk Attributes	Practices			
	Legume Crediting	Split N Application	Irrigation Scheduling	Deep Soil Nitrate Test
<u>Practicality</u>	(N=142)	(N=142)	(N=142)	(N=142)
Don't Know	16.2	4.9	4.2	5.6
Not Practical	23.2	36.6	12.7	2.8
Somewhat Practical	15.5	35.9	27.5	25.4
Practical	26.1	13.4	33.1	43.7
Very Practical	19.0	9.2	22.5	22.5
<u>Risk</u>	(N=142)	(N=142)	(N=142)	(N=142)
Don't Know	21.8	4.2	8.5	7.7
No Risk	45.8	21.1	42.3	58.5
Low Risk	17.6	26.8	33.1	26.8
Medium Risk	9.2	32.4	11.3	5.6
High Risk	5.6	15.5	4.9	1.4

Table C-2-19. Perceived Impact on Water Quality Re Farm and Community by Practice (percents) -- Nebraska

Impact on Water Quality	Practices			
	Legume Crediting	Split N Application	Irrigation Scheduling	Deep Soil Nitrate Test
Farm Level	(N=140)	(N=141)	(N=141)	(N=140)
Don't Know	23.6	2.8	5.0	6.4
Cause More Pollution	1.4	2.1	1.4	0.7
Not Hurt or Help	16.4	21.3	23.4	12.9
Prevent but Not Improve	21.4	25.5	25.5	22.9
Improve Water Quality	37.1	48.2	44.7	57.1
Community Level	(N=138)	(N=138)	(N=138)	(N=138)
Don't Know	24.6	7.2	8.7	9.4
Cause More Pollution	0.7	1.4	1.4	1.4
Not Hurt or Help	18.1	19.6	22.5	12.3
Prevent but Not Improve	17.4	23.9	22.5	26.1
Improve Water Quality	39.1	47.8	44.9	50.7

Table C-2-20. Perceived Impact on Profitability and Ease of Obtaining Information by Practice (percents) -- Nebraska

Impact on Profitability and Ease of Obtaining Information	Practices			
	Legume Crediting	Split N Application	Irrigation Scheduling	Deep Soil Nitrate Test
<u>Impact on Profitability</u>	(N=140)	(N=140)	(N=141)	(N=140)
Don't Know	23.6	10.0	10.6	10.7
Decrease Profits	9.3	25.0	4.3	2.9
No Change in Profits	7.9	27.1	26.2	25.7
Increase Profits	59.3	37.9	58.9	60.7
<u>Ease of Obtaining Information</u>	(N=140)	(N=140)	(N=141)	(N=140)
Don't Know	17.9	3.6	5.7	3.6
Not Easy	2.9	2.9	3.5	2.9
Somewhat Easy	33.6	37.1	39.0	32.9
Very Easy	45.7	56.4	51.8	60.7

Table C-2-21. Percent using best management practices in 1991 -- Nebraska

	Legume Crediting	Split Application	Deep Soil Nitrate Test
	(N=139)	(N=144)	(N=141)
Using Practice	49.6	19.4	35.5
Not using Practice	50.4	80.6	64.5

Table C-2-22. Factors used to determine when and how much irrigation water to apply in 1991 -- Nebraska

(N=92)	Used	Not used
Crop consultant recommendation	63.0	37.0
Crop rooting zone	16.3	83.7
My own intuition and experience	63.0	37.0
Need for fertilizer	0.0	100.0
Follow a set watering interval	20.7	79.3
Soil water depletion limits	22.8	77.2
Calculate or obtain evapotranspiration	8.7	91.3
Expected temperature on watering days	22.8	77.2
Soil water holding capacity	39.1	60.9
Reported values of crop water use	33.7	66.3
Past rainfall	55.4	44.6
Power company load limits and rates	7.6	92.4
An evaporation pan	0.0	100.0
Predominant soil type for each field	16.3	83.7

Table C-2-23. Awareness and Level of Familiarity by Practice (percents) -- Wisconsin

Awareness and Level of Familiarity	Practices			
	Manure Crediting	Legume Crediting	Split N Application	Farmstead Assessment
Awareness	(N=222)	(N=223)	(N=219)	(N=219)
Aware of Practice	79.3	82.1	73.5	19.6
Unaware of Practice	20.7	17.9	26.5	80.4
Level of Familiarity Among Those Aware of Practice	(N=174)	(N=179)	(N=159)	(N=45)
Unfamiliar	4.6	3.9	3.1	4.4
Somewhat Familiar	31.0	24.6	22.6	51.1
Familiar	29.3	27.4	31.4	22.2
Mostly Familiar	23.6	32.4	25.8	20.0
Completely Familiar	11.5	11.7	17.0	2.2

Table C-2-24. Perceived Expense and Labor Requirements by Practice (percents) -- Wisconsin

Expense and Labor Requirements	Practices			
	Manure Crediting	Legume Crediting	Split N Application	Farmstead Assessment
<u>Expense</u>	(N=215)	(N=214)	(N=211)	(N=202)
Don't Know	16.3	16.4	23.7	64.9
No Expense	40.0	42.1	6.2	11.4
Low Expense	34.0	26.6	28.4	15.8
Moderate Expense	8.8	13.6	37.9	6.9
High Expense	0.9	1.4	3.8	1.0
<u>Labor Requirements</u>	(N=210)	(N=210)	(N=208)	(N=200)
Don't Know	19.0	18.6	21.6	69.5
Less Labor	5.2	7.1	3.4	2.0
No Change in Labor	62.4	63.8	17.3	12.5
More Work/Existing Labor	11.0	9.5	49.5	13.5
Hire Additional Labor	2.4	1.0	8.2	2.5

Table C-2-25. Perceived Complexity and Difficulty Attributes by Practice (percents) -- Wisconsin

Complexity and Difficulty Attributes	Practices			
	Manure Crediting	Legume Crediting	Split N Application	Farmstead Assessment
<u>Complexity</u>	(N=211)	(N=211)	(N=208)	(N=199)
Don't Know	17.5	17.5	22.6	66.8
Not Complex	56.9	57.3	28.8	13.6
Somewhat Complex	19.0	19.9	36.5	13.1
Complex	6.2	4.7	9.6	6.0
Very Complex	0.5	0.5	2.4	0.5
<u>Difficulty</u>	(N=207)	(N=208)	(N=207)	(N=197)
Don't Know	18.4	17.8	22.2	72.1
Not Difficult	61.8	65.9	37.2	11.7
Somewhat Difficult	17.4	14.9	30.0	13.7
Difficult	2.4	1.4	9.7	2.5
Very Difficult	0.0	0.0	1.0	0.0

Table C-2-26. Perceived Practicality and Risk by Practice (percents) -- Wisconsin

Practicality and Risk Attributes	Practices			
	Manure Crediting	Legume Crediting	Split N Application	Farmstead Assessment
Practicality	(N=211)	(N=211)	(N=209)	(N=197)
Don't Know	13.7	12.8	22.5	69.0
Not Practical	5.7	3.8	15.3	6.1
Somewhat Practical	12.8	12.8	29.7	15.2
Practical	34.1	37.4	22.5	7.6
Very Practical	33.6	33.2	10.0	2.0
Risk	(N=209)	(N=210)	(N=208)	(N=198)
Don't Know	16.3	15.7	22.6	69.7
No Risk	54.5	58.6	31.7	18.7
Low Risk	22.0	21.9	29.8	6.6
Medium Risk	6.2	3.8	13.9	4.0
High Risk	1.0	0.0	1.9	1.0

Table C-2-27. Perceived Impact on Water Quality Re Farm and Community by Practice (percents) -- Wisconsin

Impact on Water Quality	Practices			
	Manure Crediting	Legume Crediting	Split N Application	Farmstead Assessment
Farm Level	(N=209)	(N=211)	(N=210)	(N=194)
Don't Know	19.6	18.0	23.8	66.5
Cause More Pollution	2.9	0.9	1.0	0.5
Not Hurt or Help	21.5	23.2	21.0	8.8
Prevent but Not Improve	19.1	16.1	21.0	8.2
Improve Water Quality	36.8	41.7	33.3	16.0
Community Level	(N=206)	(N=205)	(N=203)	(N=190)
Don't Know	18.9	19.0	22.7	65.3
Cause More Pollution	1.9	0.5	1.0	0.0
Not Hurt or Help	11.2	16.1	16.3	5.8
Prevent but Not Improve	18.4	14.1	17.2	6.8
Improve Water Quality	49.5	50.2	42.9	22.0

Table C-2-28. Perceived Impact on Profitability and Ease of Obtaining Information by Practice (percents) -- Wisconsin

Impact on Profitability and Ease of Obtaining Information	Practices			
	Manure Crediting	Legume Crediting	Split N Application	Farmstead Assessment
<u>Impact on Profitability</u>	(N=209)	(N=209)	(N=208)	(N=196)
Don't Know	12.9	13.9	22.1	67.3
Decrease Profits	0.5	1.0	8.7	2.0
No Change in Profits	11.0	10.0	23.1	17.9
Increase Profits	75.6	75.1	46.2	12.8
<u>Ease of Obtaining Information</u>	(N=209)	(N=208)	(N=207)	(N=195)
Don't Know	13.9	13.5	15.5	59.5
Not Easy	2.9	2.9	3.9	4.6
Somewhat Easy	40.7	39.4	40.1	21.0
Very Easy	42.6	44.2	40.6	14.9

Table C-2-29. Percent using best management practices in 1991 -- Wisconsin

	Manure Crediting	Legume Crediting	Split Application
	(N=185)	(N=211)	(N=220)
Using Practice	62.7	54.0	17.7
Not using Practice	37.3	46.0	82.3

Table C-2-30. Awareness and Level of Familiarity by Practice (percents) -- Minnesota

Awareness and Level of Familiarity	Practices			
	Manure Crediting	Legume Crediting	Split N Application	Irrigation Scheduling
<u>Awareness</u>	(N=109)	(N=109)	(N=109)	(N=109)
Aware of Practice	77.1	82.6	87.2	58.7
Unaware of Practice	22.9	17.4	12.8	41.3
<u>Level of Familiarity Among Those Aware of Practice</u>	(N=84)	(N=90)	(N=95)	(N=64)
Unfamiliar	2.4	1.1	1.1	9.4
Somewhat Familiar	40.5	27.8	9.5	28.1
Familiar	32.1	38.9	36.8	28.1
Mostly Familiar	20.2	22.2	25.3	18.8
Completely Familiar	4.8	10.0	27.4	15.6

Table C-2-31. Perceived Expense and Labor Requirements by Practice (percents) -- Minnesota

Expense and Labor Requirements	Practices			
	Manure Crediting	Legume Crediting	Split N Application	Irrigation Scheduling
Expense	(N=105)	(N=104)	(N=103)	(N=100)
Don't Know	30.5	22.1	15.5	40.0
No Expense	32.4	37.5	5.8	14.0
Low Expense	26.7	27.9	37.9	32.0
Moderate Expense	8.6	11.5	37.9	9.0
High Expense	1.9	1.0	2.9	5.0
Labor Requirements	(N=100)	(N=101)	(N=100)	(N=96)
Don't Know	32.0	25.7	18.0	45.8
Less Labor	4.0	4.0	1.0	2.1
No Change in Labor	49.0	60.4	30.0	25.0
More Work/Existing Labor	12.0	9.9	47.0	22.9
Hire Additional Labor	3.0	0.0	4.0	4.2

Table C-2-32. Perceived Complexity and Difficulty Attributes by Practice (percents) -- Minnesota

Complexity and Difficulty Attributes	Practices			
	Manure Crediting	Legume Crediting	Split N Application	Irrigation Scheduling
Complexity	(N=101)	(N=102)	(N=102)	(N=94)
Don't Know	29.7	20.6	15.7	42.6
Not Complex	52.5	64.7	53.9	26.6
Somewhat Complex	12.9	9.8	22.5	19.1
Complex	5.0	2.9	7.8	5.3
Very Complex	0.0	2.0	0.0	6.4
Difficulty	(N=99)	(N=103)	(N=102)	(N=96)
Don't Know	23.2	17.5	13.7	42.7
Not Difficult	56.6	67.0	62.7	29.2
Somewhat Difficult	18.2	13.6	21.6	20.8
Difficult	2.0	1.9	2.0	4.2
Very Difficult	0.0	0.0	0.0	3.1

Table C-2-33. Perceived Practicality and Risk by Practice (percents) -- Minnesota

Practicality and Risk Attributes	Practices			
	Manure Crediting	Legume Crediting	Split N Application	Irrigation Scheduling
<u>Practicality</u>	(N=100)	(N=104)	(N=103)	(N=96)
Don't Know	23.0	20.2	15.5	43.8
Not Practical	18.0	9.6	10.7	14.6
Somewhat Practical	10.0	11.5	14.6	6.3
Practical	25.0	29.8	29.1	19.8
Very Practical	24.0	28.8	30.1	15.6
<u>Risk</u>	(N=100)	(N=103)	(N=102)	(N=94)
Don't Know	23.0	16.5	15.7	42.6
No Risk	49.0	52.4	50.0	28.7
Low Risk	24.0	29.1	29.4	16.0
Medium Risk	3.0	1.9	3.9	7.4
High Risk	1.0	0.0	1.0	5.3

Table C-2-34. Perceived Impact on Water Quality Re Farm and Community by Practice (percents) -- Minnesota

Impact on Water Quality	Practices			
	Manure Crediting	Legume Crediting	Split N Application	Irrigation Scheduling
Farm Level	(N=99)	(N=102)	(N=101)	(N=93)
Don't Know	25.3	16.7	17.8	41.9
Cause More Pollution	2.0	2.0	1.0	1.1
Not Hurt or Help	24.2	20.6	14.9	12.9
Prevent but Not Improve	21.2	19.6	21.8	15.1
Improve Water Quality	27.3	41.2	43.6	29.0
Community Level	(N=103)	(N=103)	(N=103)	(N=97)
Don't Know	22.3	18.4	19.4	38.1
Cause More Pollution	2.9	1.0	1.0	1.0
Not Hurt or Help	20.4	19.4	16.5	10.3
Prevent but Not Improve	23.3	21.4	19.4	15.5
Improve Water Quality	31.1	39.8	43.7	35.1

Table C-2-35. Perceived Impact on Profitability and Ease of Obtaining Information by Practice (percents) -- Minnesota

Impact on Profitability and Ease of Obtaining Information	Practices			
	Manure Crediting	Legume Crediting	Split N Application	Irrigation Scheduling
Impact on Profitability	(N=100)	(N=101)	(N=100)	(N=93)
Don't Know	21.0	18.8	18.0	39.8
Decrease Profits	1.0	2.0	3.0	3.2
No Change in Profits	9.0	7.9	14.0	5.4
Increase Profits	69.0	71.3	65.0	51.6
Ease of Obtaining Information	(N=103)	(N=103)	(N=103)	(N=97)
Don't Know	20.4	17.5	15.5	30.9
Not Easy	3.9	2.9	1.9	7.2
Somewhat Easy	35.0	34.0	29.1	20.6
Easy	40.8	45.6	53.4	41.2

Table C-2-36. Awareness and Level of Familarity by Practice (percents) -- Texas

Awareness and Level of Familarity	Practices			
	Prescribed Burning	Reduced Herbicides	Mechanical Brush Control	Riparian Area Management
<u>Awareness</u>	(N=38)	(N=39)	(N=40)	(N=39)
Aware of Practice	92.1	64.1	97.5	30.8
Unaware of Practice	7.9	35.9	2.5	69.2
<u>Level of Familarity Among Those Aware of Practice</u>	(N=35)	(N=25)	(N=39)	(N=12)
Unfamiliar	20.0	16.0	5.1	0.0
Somewhat Familiar	37.1	40.0	12.8	33.3
Familiar	22.9	24.0	23.1	33.3
Mostly Familiar	11.4	20.0	30.8	25.0
Completely Familiar	8.6	0.0	28.2	8.3

Table C-2-37. Awareness and Level of Familarity by Practice (percents) -- Texas

Awareness and Level of Familarity	Practices	
	Soil Testing	Split Application
<u>Awareness</u>	(N=22)	(N=22)
Aware of Practice	86.4	54.5
Unaware of Practice	13.6	45.5
<u>Level of Familarity Among Those Aware of Practice</u>	(N=20)	(N=12)
Unfamiliar	5.0	8.3
Somewhat Familiar	20.0	25.0
Familiar	35.0	16.7
Mostly Familiar	20.0	16.7
Completely Familiar	20.0	33.3

Table C-2-38. Perceived Expense and Labor Requirements by Practice (percents) -- Texas

Expense and Labor Requirements	Practices			
	Prescribed Burning	Reduced Herbicides	Mechanical Brush Control	Riparian Area Management
Expense	(N=38)	(N=37)	(N=37)	(N=35)
Don't Know	15.8	40.5	16.2	57.1
No Expense	18.4	5.4	0.0	5.7
Low Expense	47.4	10.8	0.0	5.7
Moderate Expense	18.4	32.4	32.4	17.1
High Expense	0.0	10.8	51.4	14.3
Labor Requirements	(N=37)	(N=37)	(N=38)	(N=35)
Don't Know	29.7	40.5	18.4	65.7
Less Labor	8.1	8.1	2.6	2.9
No Change in Labor	27.0	24.3	15.8	14.3
More Work/Existing Labor	16.2	18.9	26.3	8.6
Hire Additional Labor	18.9	8.1	36.8	8.6

Table C-2-39. Perceived Expense and Labor Requirements by Practice (percents) -- Texas

Expense and Labor Requirements	Practices	
	Soil Testing	Split Application
Expense	(N=22)	(N=22)
Don't Know	22.7	40.9
No Expense	13.6	4.5
Low Expense	40.9	13.6
Moderate Expense	18.2	36.4
High Expense	4.5	4.5
Labor Requirements	(N=20)	(N=21)
Don't Know	20.0	33.3
Less Labor	0.0	0.0
No Change in Labor	75.0	42.9
More Work/Existing Labor	5.0	19.0
Hire Additional Labor	0.0	4.8

Table C-2-40. Perceived Complexity and Difficulty Attributes by Practice (percents) -- Texas

Complexity and Difficulty Attributes	Practices			
	Prescribed Burning	Reduced Herbicides	Mechanical Brush Control	Riparian Area Management
<u>Complexity</u>	(N=35)	(N=36)	(N=36)	(N=36)
Don't Know	20.0	33.3	16.7	69.4
Not Complex	40.0	38.9	44.4	11.1
Somewhat Complex	20.0	22.2	13.9	8.3
Complex	11.4	5.6	13.9	5.6
Very Complex	8.6	0.0	11.1	5.6
<u>Difficulty</u>	(N=37)	(N=37)	(N=38)	(N=37)
Don't Know	18.9	29.7	13.2	64.9
Not Difficult	48.6	37.8	47.4	16.2
Somewhat Difficult	16.2	24.3	15.8	5.4
Difficult	10.8	8.1	15.8	10.8
Very Difficult	5.4	0.0	7.9	2.7

Table C-2-41. Perceived Complexity and Difficulty Attributes by Practice (percents) -- Texas

Complexity and Difficulty Attributes	Practices	
	Soil Testing	Split Application
<u>Complexity</u>	(N=20)	(N=21)
Don't Know	10.0	23.8
Not Complex	75.0	33.3
Somewhat Complex	5.0	19.0
Complex	5.0	19.0
Very Complex	5.0	4.8
<u>Difficulty</u>	(N=21)	(N=22)
Don't Know	9.5	18.2
Not Difficult	71.4	40.9
Somewhat Difficult	14.3	31.8
Difficult	4.8	9.1
Very Difficult	0.0	0.0

Table C-2-42. Perceived Practicality and Risk by Practice (percents) -- Texas

Practicality and Risk Attributes	Practices			
	Prescribed Burning	Reduced Herbicides	Mechanical Brush Control	Riparian Area Management
Practicality	(N=37)	(N=36)	(N=38)	(N=37)
Don't Know	10.8	25.0	10.5	59.5
Not Practical	32.4	19.4	15.8	21.6
Somewhat Practical	13.5	25.0	13.2	5.4
Practical	18.9	16.7	31.6	8.1
Very Practical	24.3	13.9	28.9	5.4
Risk	(N=37)	(N=36)	(N=36)	(N=36)
Don't Know	16.2	25.0	5.6	58.3
No Risk	8.1	22.2	63.9	19.4
Low Risk	27.0	33.3	27.8	16.7
Medium Risk	24.3	19.4	0.0	2.8
High Risk	24.3	0.0	2.8	2.8

Table C-2-43. Perceived Practicality and Risk by Practice (percents) -- Texas

Practicality and Risk Attributes	Practices	
	Soil Testing	Split Application
<u>Practicality</u>	(N=21)	(N=21)
Don't Know	14.3	33.3
Not Practical	9.5	23.8
Somewhat Practical	14.3	14.3
Practical	47.6	19.0
Very Practical	14.3	9.5
<u>Risk</u>	(N=21)	(N=21)
Don't Know	14.3	38.1
No Risk	76.2	38.1
Low Risk	9.5	23.8
Medium Risk	0.0	0.0
High Risk	0.0	0.0

Table C-2-44. Perceived Impact on Water Quality Re Farm and Community by Practice (percents) -- Texas

Impact on Water Quality	Practices			
	Prescribed Burning	Reduced Herbicides	Mechanical Brush Control	Riparian Area Management
<u>Farm Level</u>	(N=37)	(N=38)	(N=38)	(N=37)
Don't Know	24.3	31.6	21.1	73.0
Cause More Pollution	2.7	7.9	5.3	2.7
Not Hurt or Help	45.9	28.9	34.2	5.4
Prevent but Not Improve	5.4	10.5	13.2	2.7
Improve Water Quality	21.6	21.1	26.3	16.2
<u>Community Level</u>	(N=35)	(N=35)	(N=35)	(N=35)
Don't Know	40.0	37.1	34.3	62.9
Cause More Pollution	2.9	2.9	5.7	0.0
Not Hurt or Help	40.0	25.7	28.6	17.1
Prevent but Not Improve	2.9	8.6	11.4	2.9
Improve Water Quality	14.3	25.7	20.0	17.1

Table C-2-45. Perceived Impact on Water Quality Re Farm and Community by Practice (percents) -- Texas

Impact on Water Quality	Practices	
	Soil Testing	Split Application
<u>Farm Level</u>	(N=20)	(N=21)
Don't Know	20.0	47.6
Cause More Pollution	0.0	0.0
Not Hurt or Help	45.0	33.3
Prevent but Not Improve	20.0	9.5
Improve Water Quality	15.0	9.5
<u>Community Level</u>	(N=20)	(N=21)
Don't Know	35.0	52.4
Cause More Pollution	0.0	0.0
Not Hurt or Help	50.0	33.3
Prevent but Not Improve	5.0	4.8
Improve Water Quality	10.0	9.5

Table C-2-46. Perceived Impact on Profitability and Ease of Obtaining Information by Practice (percents) -- Texas

Impact on Profitability and Ease of Obtaining Information	Practices			
	Prescribed Burning	Reduced Herbicides	Mechanical Brush Control	Riparian Area Management
Impact on Profitability	(N=37)	(N=37)	(N=38)	(N=36)
Don't Know	10.8	29.7	13.2	63.9
Decrease Profits	0.0	13.5	7.9	2.8
No Change in Profits	13.5	8.1	5.3	19.4
Increase Profits	75.7	48.6	73.7	13.9
Ease of Obtaining Information	(N=36)	(N=36)	(N=35)	(N=34)
Don't Know	8.3	19.4	8.6	55.9
Not Easy	2.8	5.6	0.0	2.9
Somewhat Easy	52.8	36.1	25.7	23.5
Very Easy	36.1	38.9	65.7	17.6

Table C-2-47. Perceived Impact on Profitability and Ease of Obtaining Information by Practice (percents) -- Texas

Impact on Profitability and Ease of Obtaining Information	Practices	
	Soil Testing	Split Application
<u>Impact on Profitability</u>	(N=21)	(N=22)
Don't Know	19.0	40.9
Decrease Profits	0.0	4.5
No Change in Profits	4.8	4.5
Increase Profits	76.2	50.0
<u>Ease of Obtaining Information</u>	(N=21)	(N=21)
Don't Know	19.0	28.6
Not Easy	0.0	0.0
Somewhat Easy	14.3	19.0
Very Easy	66.7	52.4

Table C-2-48. Use of the best management practices -- Texas Range and Farm Demonstration only

Texas Range	(N=21) Prescribed Burning	(N=16) Mechanical Brush Control	(N=14) Riparian Area Mgt.
Use practice	33.3	43.8	57.1
Do not use practice	66.7	56.2	42.9

Texas Farm	(N=22) Soil Testing	(N=22) Split Application
Use practice	68.2	13.6
Do not use practice	31.8	86.4

Table C-2-49. Awareness and Level of Familiarity by Practice (percents) -- Florida Citrus Producers

Awareness and Level of Familiarity	Practices		
	Multiple Applications	Irrigation System Tests	Soil Moisture Tests
Awareness	(N=55)	(N=54)	(N=53)
Aware of Practice	94.5	83.3	71.7
Unaware of Practice	5.5	16.7	28.3
Level of Familiarity Among Those Aware of Practice	(N=52)	(N=46)	(N=40)
Unfamiliar	1.9	0.0	5.0
Somewhat Familiar	7.7	21.7	35.0
Familiar	21.2	32.6	25.0
Mostly Familiar	38.5	28.3	17.5
Completely Familiar	30.8	17.4	17.5

Table C-2-50. Awareness and Level of Familiarity by Practice (percents) -- Florida Vegetable Producers

Awareness and Level of Familiarity	Practices		
	Fertilizer Management	Water Table Monitoring	Seep Irrigation
<u>Awareness</u>	(N=24)	(N=25)	(N=25)
Aware of Practice	83.3	84.0	92.0
Unaware of Practice	16.7	16.0	8.0
<u>Level of Familiarity Among Those Aware of Practice</u>	(N=21)	(N=21)	(N=23)
Unfamiliar	0.0	14.3	8.7
Somewhat Familiar	28.6	14.3	21.7
Familiar	14.3	19.0	13.0
Mostly Familiar	38.1	9.5	21.7
Completely Familiar	19.0	42.9	34.8

Table C-2-51. Awareness and Level of Familiarity by Practice (percents) -- Florida Citrus and Vegetable Producers

Awareness and Level of Familiarity	Practice
	Irrigation Scheduling
Awareness	(N=77)
Aware of Practice	81.8
Unaware of Practice	18.2
Level of Familiarity Among Those Aware of Practice	(N=65)
Unfamiliar	4.6
Somewhat Familiar	15.4
Familiar	32.3
Mostly Familiar	23.1
Completely Familiar	24.6

Table C-2-52. Perceived Expense and Labor Requirements by Practice (percents) -- Florida Citrus Producers

Expense and Labor Requirements	Practices		
	Multiple Applications	Irrigation System Tests	Soil Moisture Tests
<u>Expense</u>	(N=52)	(N=49)	(N=49)
Don't Know	17.3	22.4	28.6
No Expense	3.8	12.2	6.1
Low Expense	25.0	51.0	49.0
Moderate Expense	48.1	12.2	12.2
High Expense	5.8	2.0	4.1
<u>Labor Requirements</u>	(N=51)	(N=49)	(N=49)
Don't Know	9.8	20.4	26.5
Less Labor	2.0	4.1	2.0
No Change in Labor	49.0	44.9	38.8
More Work/Existing Labor	31.4	24.5	28.6
Hire Additional Labor	7.8	6.1	4.1

Table C-2-53. Perceived Expense and Labor Requirements by Practice (percents) -- Florida Vegetable Producers

Expense and Labor Requirements	Practices		
	Fertilizer Management	Water Table Monitoring	Seep Irrigation
<u>Expense</u>	(N=25)	(N=24)	(N=24)
Don't Know	4.0	8.3	4.2
No Expense	16.0	8.3	0.0
Low Expense	28.0	70.8	12.5
Moderate Expense	52.0	12.5	25.0
High Expense	0.0	0.0	58.3
<u>Labor Requirements</u>	(N=25)	(N=24)	(N=24)
Don't Know	0.0	4.2	12.5
Less Labor	4.0	4.2	0.0
No Change in Labor	72.0	75.0	25.0
More Work/Existing Labor	20.0	16.7	37.5
Hire Additional Labor	4.0	0.0	25.0

Table C-2-54. Perceived Expense and Labor Requirements by Practice (percents) -- Florida Citrus and Vegetable Producers

Expense and Labor Requirements	Practice: Irrigation Scheduling
Expense	(N=75)
Don't Know	16.0
No Expense	24.0
Low Expense	41.3
Moderate Expense	13.3
High Expense	5.3
Labor Requirements	(N=75)
Don't Know	12.0
Less Labor	2.7
No Change in Labor	62.7
More Work/Existing Labor	20.0
Hire Additional Labor	2.7

Table C-2-55. Perceived Complexity and Difficulty Attributes by Practice (percents) -- Florida Citrus Producers

Complexity and Difficulty Attributes	Practices		
	Multiple Applications	Irrigation System Tests	Soil Moisture Tests
<u>Complexity</u>	(N=51)	(N=49)	(N=50)
Don't Know	9.8	16.3	16.0
Not Complex	58.8	49.0	46.0
Somewhat Complex	19.6	28.6	28.0
Complex	11.8	6.1	10.0
Very Complex	0.0	0.0	0.0
<u>Difficulty</u>	(N=51)	(N=48)	(N=48)
Don't Know	2.0	12.5	16.7
Not Difficult	68.6	54.2	47.9
Somewhat Difficult	23.5	29.2	29.2
Difficult	5.9	4.2	6.3
Very Difficult	0.0	0.0	0.0

Table C-2-56. Perceived Complexity and Difficulty Attributes by Practice (percents) -- Florida Vegetable Producers

Complexity and Difficulty Attributes	Practices		
	Fertilizer Management	Water Table Monitoring	Seep Irrigation
Complexity	(N=24)	(N=23)	(N=23)
Don't Know	4.2	8.7	4.3
Not Complex	50.0	65.2	34.8
Somewhat Complex	25.0	21.7	26.1
Complex	20.8	4.3	21.7
Very Complex	0.0	0.0	13.0
Difficulty	(N=24)	(N=24)	(N=24)
Don't Know	8.3	8.3	16.7
Not Difficult	29.2	79.2	29.2
Somewhat Difficult	41.7	8.3	25.0
Difficult	20.8	4.2	12.5
Very Difficult	0.0	0.0	16.7

Table C-2-57. Perceived Complexity and Difficulty Attributes by Practice (percents) -- Florida Citrus and Vegetable Producers

Complexity and Difficulty Attributes	Practice
	Irrigation Scheduling
<u>Complexity</u>	(N=73)
Don't Know	11.0
Not Complex	54.8
Somewhat Complex	27.4
Complex	6.8
Very Complex	0.0
<u>Difficulty</u>	(N=73)
Don't Know	12.3
Not Difficult	52.1
Somewhat Difficult	28.8
Difficult	6.8
Very Difficult	0.0

Table C-2-58. Perceived Practicality and Risk by Practice (percents) -- Florida Citrus Producers

Practicality and Risk Attributes	Practices		
	Multiple Applications	Irrigation System Tests	Soil Moisture Tests
<u>Practicality</u>	(N=51)	(N=49)	(N=49)
Don't Know	9.8	10.2	16.3
Not Practical	5.9	2.0	6.1
Somewhat Practical	17.6	30.6	30.6
Practical	33.3	34.7	28.6
Very Practical	33.3	22.4	18.4
<u>Risk</u>	(N=50)	(N=47)	(N=47)
Don't Know	14.0	12.8	14.9
No Risk	52.0	63.8	59.6
Low Risk	28.0	14.9	17.0
Medium Risk	6.0	6.4	8.5
High Risk	0.0	2.1	0.0

Table C-2-59. Perceived Practicality and Risk by Practice (percents) -- Florida Vegetable Producers

Practicality and Risk Attributes	Practices		
	Fertilizer Management	Water Table Monitoring	Seep Irrigation
Practicality	(N=25)	(N=24)	(N=24)
Don't Know	4.0	4.2	8.3
Not Practical	8.0	0.0	12.5
Somewhat Practical	16.0	16.7	20.8
Practical	28.0	33.3	29.2
Very Practical	44.0	45.8	29.2
Risk	(N=24)	(N=23)	(N=23)
Don't Know	4.2	13.0	13.0
No Risk	33.3	52.2	34.8
Low Risk	33.3	34.8	21.7
Medium Risk	20.8	0.0	21.7
High Risk	8.3	0.0	8.7

Table C-2-60. Perceived Practicality and Risk by Practice (percents) -- Florida Citrus and Vegetable Producers

Practicality and Risk Attributes	Practice
	Irrigation Scheduling
Practicality	(N=75)
Don't Know	10.7
Not Practical	1.3
Somewhat Practical	22.7
Practical	26.7
Very Practical	38.7
Risk	(N=71)
Don't Know	11.3
No Risk	57.7
Low Risk	22.5
Medium Risk	7.0
High Risk	1.4

Table C-2-61. Perceived Impact on Water Quality Re Farm and Community by Practice (percents) -- Florida Citrus Producers

Impact on Water Quality	Practices		
	Multiple Applications	Irrigation System Tests	Soil Moisture Tests
Farm Level	(N=48)	(N=46)	(N=46)
Don't Know	12.5	13.0	15.2
Cause More Pollution	0.0	0.0	0.0
Not Hurt or Help	37.5	43.5	45.7
Prevent but Not Improve	14.6	19.6	17.4
Improve Water Quality	35.4	23.9	21.7
Community Level	(N=46)	(N=45)	(N=45)
Don't Know	10.9	8.9	11.1
Cause More Pollution	0.0	0.0	0.0
Not Hurt or Help	37.0	48.9	48.9
Prevent but Not Improve	8.7	13.3	13.3
Improve Water Quality	43.5	28.9	26.7

Table C-2-62. Perceived Impact on Water Quality Re Farm and Community by Practice (percents) -- Florida Vegetable Producers

Impact on Water Quality	Practices		
	Fertilizer Management	Water Table Monitoring	Seep Irrigation
<u>Farm Level</u>	(N=25)	(N=24)	(N=24)
Don't Know	8.0	16.7	8.3
Cause More Pollution	0.0	0.0	0.0
Not Hurt or Help	12.0	25.0	29.2
Prevent but Not Improve	28.0	20.8	20.8
Improve Water Quality	52.0	37.5	41.7
<u>Community Level</u>	(N=24)	(N=23)	(N=23)
Don't Know	8.3	17.4	13.0
Cause More Pollution	0.0	0.0	0.0
Not Hurt or Help	12.5	26.1	26.1
Prevent but Not Improve	25.0	21.7	17.4
Improve Water Quality	54.2	34.8	43.5

Table C-2-63. Perceived Impact on Water Quality Re Farm and Community by Practice (percents) -- Florida Citrus and Vegetable Producers

Impact on Water Quality	Practice
	Irrigation Scheduling
Farm Level	(N=72)
Don't Know	15.3
Cause More Pollution	0.0
Not Hurt or Help	33.3
Prevent but Not Improve	20.8
Improve Water Quality	30.6
Community Level	(N=69)
Don't Know	13.0
Cause More Pollution	0.0
Not Hurt or Help	31.9
Prevent but Not Improve	23.2
Improve Water Quality	31.9

Table C-2-64. Perceived Impact on Profitability and Ease of Obtaining Information by Practice (percents) -- Florida Citrus Producers

Impact on Profitability and Ease of Obtaining Information	Practices		
	Multiple Applications	Irrigation System Tests	Soil Moisture Tests
Impact on Profitability	(N=50)	(N=48)	(N=48)
Don't Know	16.0	10.4	10.4
Decrease Profits	16.0	12.5	14.6
No Change in Profits	22.0	33.3	33.3
Increase Profits	46.0	43.8	41.7
Ease of Obtaining Information	(N=49)	(N=46)	(N=46)
Don't Know	12.2	13.0	15.2
Not Easy	6.1	4.3	8.7
Somewhat Easy	34.7	43.5	37.0
Very Easy	46.9	39.1	39.1

Table C-2-65. Perceived Impact on Profitability and Ease of Obtaining Information by Practice (percents) -- Florida Vegetable Producers

Impact on Profitability and Ease of Obtaining Information	Practices		
	Fertilizer Management	Water Table Monitoring	Seep Irrigation
Impact on Profitability	(N=25)	(N=24)	(N=24)
Don't Know	16.0	16.7	20.8
Decrease Profits	12.0	0.0	20.8
No Change in Profits	20.0	37.5	29.2
Increase Profits	52.0	45.8	29.2
Ease of Obtaining Information	(N=25)	(N=24)	(N=24)
Don't Know	8.0	12.5	8.3
Not Easy	12.0	0.0	12.5
Somewhat Easy	36.0	45.8	37.5
Very Easy	44.0	41.7	41.7

Table C-2-66. Perceived Impact on Profitability and Ease of Obtaining Information by Practice (percents) -- Florida Citrus and Vegetable Producers

Impact on Profitability and Ease of Obtaining Information	Practice Irrigation Scheduling
<u>Impact on Profitability</u>	(N=72)
Don't Know	12.5
Decrease Profits	6.9
No Change in Profits	29.2
Increase Profits	51.4
<u>Ease of Obtaining Information</u>	(N=71)
Don't Know	12.7
Not Easy	9.9
Somewhat Easy	38.0
Very Easy	39.4

Table C-2-67. Awareness and Level of Familiarity by Practice (percents) -- North Carolina Field Farms

Awareness and Level of Familiarity	Practice
	Split Application
	(N=77)
Awareness	
Aware of Practice	84.4
Unaware of Practice	15.6
Level of Familiarity Among Those Aware of Practice	(N=65)
Unfamiliar	0.0
Somewhat Familiar	4.6
Familiar	29.2
Mostly Familiar	24.6
Completely Familiar	41.5

Table C-2-68. Awareness and Level of Familiarity by Practice (percents) -- North Carolina Poultry Farms

Awareness and Level of Familiarity	Practice
	Poultry Composting
<u>Awareness</u>	(N=22)
Aware of Practice	72.7
Unaware of Practice	27.3
<u>Level of Familiarity Among Those Aware of Practice</u>	(N=16)
Unfamiliar	31.3
Somewhat Familiar	18.8
Familiar	31.3
Mostly Familiar	6.3
Completely Familiar	12.5

Table C-2-69. Awareness and Level of Familiarity by Practice (percents) -- North Carolina Field and Poultry Farms

Awareness and Level of Familiarity	Practice: Animal Waste Crediting
Awareness	(N=98)
Aware of Practice	70.4
Unaware of Practice	29.6
Level of Familiarity Among Those Aware of Practice	(N=70)
Unfamiliar	4.3
Somewhat Familiar	38.6
Familiar	30.0
Mostly Familiar	18.6
Completely Familiar	8.6

Table C-2-70. Perceived Expense and Labor Requirements by Practice (percents) -- North Carolina Field Farms

Expense and Labor Requirements	Practice
	Split Application
<u>Expense</u>	(N=76)
Don't Know	14.5
No Expense	7.9
Low Expense	27.6
Moderate Expense	46.1
High Expense	3.9
<u>Labor Requirements</u>	(N=74)
Don't Know	10.8
Less Labor	1.4
No Change in Labor	51.4
More Work/Existing Labor	32.4
Hire Additional Labor	4.1

Table C-2-71. Perceived Expense and Labor Requirements by Practice (percents) -- North Carolina Poultry Farms

Expense and Labor Requirements	Practice
	Poultry Composting
<u>Expense</u>	(N=20)
Don't Know	30.0
No Expense	0.0
Low Expense	15.0
Moderate Expense	35.0
High Expense	20.0
<u>Labor Requirements</u>	(N=20)
Don't Know	30.0
Less Labor	5.0
No Change in Labor	5.0
More Work/Existing Labor	40.0
Hire Additional Labor	20.0

Table C-2-72. Perceived Expense and Labor Requirements by Practice (percents) -- North Carolina Field and Poultry Farms

Expense and Labor Requirements	Practice
	Animal Waste Crediting
Expense	(N=93)
Don't Know	12.9
No Expense	14.0
Low Expense	43.0
Moderate Expense	30.1
High Expense	0.0
Labor Requirements	(N=89)
Don't Know	15.7
Less Labor	5.6
No Change in Labor	53.9
More Work/Existing Labor	21.3
Hire Additional Labor	3.4

Table C-2-73. Perceived Complexity and Difficulty Attributes by Practice (percents) -- North Carolina Field Farms

Complexity and Difficulty Attributes	Practice
	Split Application
<u>Complexity</u>	(N=76)
Don't Know	18.4
Not Complex	56.6
Somewhat Complex	18.4
Complex	6.6
Very Complex	0.0
<u>Difficulty</u>	(N=77)
Don't Know	7.8
Not Difficult	75.3
Somewhat Difficult	11.7
Difficult	3.9
Very Difficult	1.3

Table C-2-74. Perceived Complexity and Difficulty Attributes by Practice (percents) -- North Carolina Poultry Farms

Complexity and Difficulty Attributes	Practice
	Poultry Composting
<u>Complexity</u>	(N=19)
Don't Know	42.1
Not Complex	15.8
Somewhat Complex	26.3
Complex	10.5
Very Complex	5.3
<u>Difficulty</u>	(N=20)
Don't Know	30.0
Not Difficult	20.0
Somewhat Difficult	25.0
Difficult	20.0
Very Difficult	5.0

Table C-2-75. Perceived Complexity and Difficulty Attributes by Practice (percents) -- North Carolina Field and Poultry Farms

Complexity and Difficulty Attributes	Practice
	Animal Waste Crediting
Complexity	(N=91)
Don't Know	26.4
Not Complex	49.5
Somewhat Complex	18.7
Complex	4.4
Very Complex	1.1
Difficulty	(N=93)
Don't Know	16.1
Not Difficult	52.7
Somewhat Difficult	21.5
Difficult	8.6
Very Difficult	1.1

Table C-2-76. Perceived Practicality and Risk by Practice (percents) -- North Carolina Field Farms

Practicality and Risk Attributes	Practice
	Split Application
Practicality	(N=76)
Don't Know	13.2
Not Practical	6.6
Somewhat Practical	14.5
Practical	43.4
Very Practical	22.4
Risk	(N=77)
Don't Know	13.0
No Risk	53.2
Low Risk	24.7
Medium Risk	7.8
High Risk	1.3

Table C-2-77. Perceived Practicality and Risk by Practice (percents) -- North Carolina and Poultry Farms

Practicality and Risk Attributes	Practice
	Poultry Composting
Practicality	(N=20)
Don't Know	30.0
Not Practical	25.0
Somewhat Practical	20.0
Practical	25.0
Very Practical	0.0
Risk	(N=20)
Don't Know	35.0
No Risk	25.0
Low Risk	25.0
Medium Risk	10.0
High Risk	5.0

Table C-2-78. Perceived Practicality and Risk by Practice (percents) -- North Carolina Field and Poultry Farms

Practicality and Risk Attributes	Practice
	Animal Waste Crediting
<u>Practicality</u>	(N=93)
Don't Know	20.4
Not Practical	12.9
Somewhat Practical	26.9
Practical	23.7
Very Practical	16.1
<u>Risk</u>	(N=93)
Don't Know	16.1
No Risk	39.8
Low Risk	26.9
Medium Risk	12.9
High Risk	4.3

Table C-2-79. Perceived Impact on Water Quality Re Farm and Community by Practice (percents) -- North Carolina Field Farms

Impact on Water Quality	Practice Split Application
<u>Farm Level</u>	(N=75)
Don't Know	25.3
Cause More Pollution	0.0
Not Hurt or Help	32.0
Prevent but Not Improve	13.3
Improve Water Quality	29.3
<u>Community Level</u>	(N=75)
Don't Know	28.0
Cause More Pollution	1.3
Not Hurt or Help	21.3
Prevent but Not Improve	22.7
Improve Water Quality	26.7

Table C-2-80. Perceived Impact on Water Quality Re Farm and Community by Practice (percents) -- North Carolina Poultry Farms

Impact on Water Quality	Practice
	Poultry Composting
Farm Level	(N=19)
Don't Know	36.8
Cause More Pollution	10.5
Not Hurt or Help	42.1
Prevent but Not Improve	0.0
Improve Water Quality	10.5
Community Level	(N=18)
Don't Know	38.9
Cause More Pollution	5.6
Not Hurt or Help	22.2
Prevent but Not Improve	22.2
Improve Water Quality	11.1

Table C-2-81. Perceived Impact on Water Quality Re Farm and Community by Practice (percents) -- North Carolina Field and Poultry Farms

Impact on Water Quality	Practice: Animal Waste Crediting
Farm Level	(N=94)
Don't Know	26.6
Cause More Pollution	10.6
Not Hurt or Help	34.0
Prevent but Not Improve	9.6
Improve Water Quality	19.1
Community Level	(N=93)
Don't Know	32.3
Cause More Pollution	5.4
Not Hurt or Help	19.4
Prevent but Not Improve	11.8
Improve Water Quality	31.2

Table C-2-82. Perceived Impact on Profitability and Ease of Obtaining Information by Practice (percents) -- North Carolina Field Farms

Impact on Profitability and Ease of Obtaining Information	Practice Split Application
<u>Impact on Profitability</u>	(N=74)
Don't Know	25.7
Decrease Profits	5.4
No Change in Profits	24.3
Increase Profits	44.6
<u>Ease of Obtaining Information</u>	(N=76)
Don't Know	19.7
Not Easy	1.3
Somewhat Easy	42.1
Very Easy	36.8

Table C-2-83. Perceived Impact on Profitability and Ease of Obtaining Information by Practice (percents) -- North Carolina Poultry Farms

Impact on Profitability and Ease of Obtaining Information	Practice: Poultry Composting
Impact on Profitability	(N=19)
Don't Know	31.6
Decrease Profits	10.5
No Change in Profits	26.3
Increase Profits	31.6
Ease of Obtaining Information	(N=19)
Don't Know	26.3
Not Easy	0.0
Somewhat Easy	36.8
Very Easy	36.8

Table C-2-84. Perceived Impact on Profitability and Ease of Obtaining Information by Practice (percents) -- North Carolina Field and Poultry Farms

Impact on Profitability and Ease of Obtaining Information	Practice Animal Waste Crediting
Impact on Profitability	(N=92)
Don't Know	26.1
Decrease Profits	4.3
No Change in Profits	16.3
Increase Profits	53.3
Ease of Obtaining Information	(N=95)
Don't Know	24.2
Not Easy	3.2
Somewhat Easy	44.2
Very Easy	28.4

Table C-2-85. Use of animal waste crediting practice -- North Carolina Field and Poultry Farms

	(N=32)
Use of animal waste crediting	21.9
Do not use of animal waste crediting	78.1

Table C-2-86. Use of split application -- North Carolina Field

Use split application	59.5
Do not use split application	40.5

Farming Practices in Frederick County

Who should complete this questionnaire?

The questionnaire should be completed by the person most responsible for farm management decisions.

Did you make most of the management decisions on this farm in 1991?
Check the circle (✓) that best applies.

- ◯ Yes, I own or rent all of the land that I operate. →
- ◯ Yes, I am a hired manager, foreman, or caretaker. →

Please go to the next page!

- ◯ No, I do not own, operate or manage a farm. →

Please stop here and return the survey in the enclosed envelope.

- ◯ No, I currently own the farm, but do not operate or make most management decisions on the farm.

Please indicate the name and address of the person who does in the space below, and return the survey in the enclosed envelope.

Operator's Name: ______________________________

Operator's Address: ______________________________

____

____

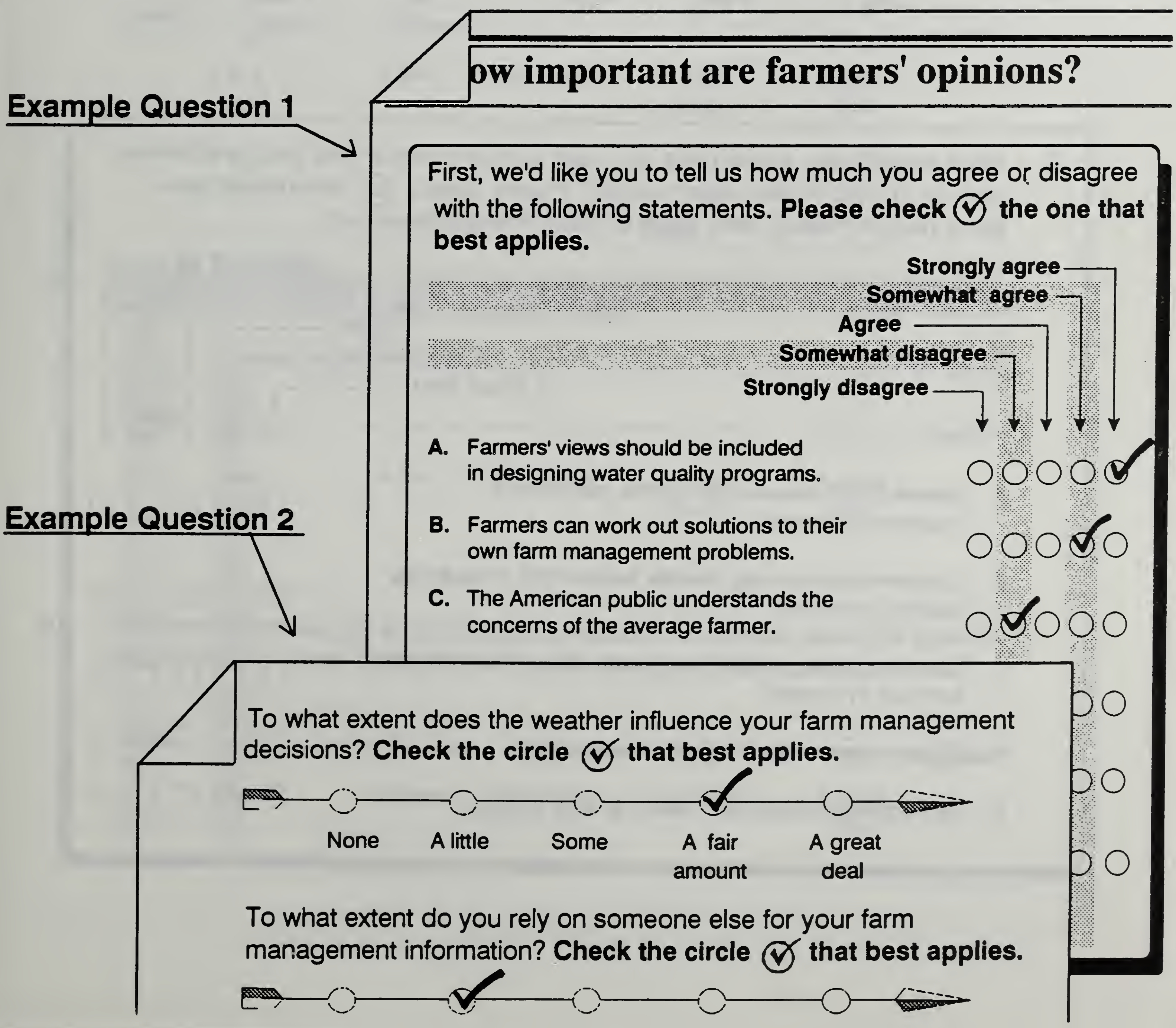
Operator's Phone #:(   )   –

How to share your views

1. Make all responses dark, and complete as shown in the examples below.

2. Feel free to write any comments or explanations on this survey.

3. Mail your completed form in the enclosed stamped, pre-addressed envelope.



Where do you get information?

There has been some discussion about how agriculture may affect water quality -- about how fertilizers, pesticides, and some management practices might contaminate surface or groundwater.

1. Consider all the places you get information -- radio and television, newspapers, community organizations, talking with other people. How much have you heard or read in the past 12 months about specific things that you as a farmer can do to help protect water quality? **Check the circle ✓ that best applies.**

None	A little	Some	A fair amount	A great deal
○	○	○	○	○

2. More specifically, where have you read or heard about what you as a farmer can do to help protect water quality? **Please check ✓ how much you have read or heard from <u>each</u> of the following sources:**

	A great deal	A fair amount	Some	A little	Nothing at all
A. Extension, soil conservation agents, government, or university sources?	○	○	○	○	○
B. Commercial farm supply dealers, salespeople, consultants, lenders, or buyers?	○	○	○	○	○
C. Farm magazines, private newspapers, newsletters, farm radio and farm TV shows?	○	○	○	○	○
D. General news media (TV, radio, newspapers)?	○	○	○	○	○
E. Conversations with family, friends, or other farmers?	○	○	○	○	○

3. When you come across information about what you as a farmer can do to help protect water quality, **how much attention** do you usually pay to it? **Check the ◯ circle that best applies.**

○ None ○ A little ○ Some ○ A fair amount ○ A great deal

4. Overall, to what extent do you **need more information** about what you as a farmer can do to help protect water quality?

○ Not at all ○ A little ○ Somewhat ○ A fair amount ○ A great deal

5. To what extent have you **looked for information** about farm management practices that protect or improve water quality?

○ Not at all ○ A little ○ Somewhat ○ A fair amount ○ A great deal

6. Sometimes farmers **get conflicting information** about what would be best for helping protect water quality. How often, if ever, has that happened to you?

○ Never ○ Seldom ○ Sometimes ○ Frequently ○ A great deal

7. How often do you **talk with other farmers** about farm practices you could use to help protect water quality?

○ Never	○ Seldom	○ Sometimes	○ Frequently	○ A great deal

8. Compared to other farmers in your local community, **how much information do you have** about farm practices that could help protect water quality?

○ I have almost none	○ I have a little	○ I have some	○ I have a fair amount	○ I have a lot

9. Compared to other farmers in your local community, **how likely are you to be asked** for information and advice about farm practices that could protect water quality?

○ Very unlikely	○ Unlikely	○ Neither unlikely nor likely	○ Likely	○ Very likely

10. How often does the **topic of environmental regulation**, or potential regulation of agricultural practices, come up when you talk with other farmers?

○ Never	○ Seldom	○ Sometimes	○ Frequently	○ A great deal

11. In your opinion, to what extent is water pollution a problem in each of the following places. **Check the circle that best applies for each.**

	A very serious problem	A serious problem	A problem	A slight problem	Not a problem
A. The nation as a whole	○	○	○	○	○
B. Maryland	○	○	○	○	○
C. Your county	○	○	○	○	○
D. Your farm	○	○	○	○	○

12. How much of an impact do you think farmers like yourself have on water pollution problems in each of the following places? **Check the circle that best applies for each.**

	A major impact	A moderate impact	Some impact	A slight impact	No impact
A. The nation as a whole	○	○	○	○	○
B. Maryland	○	○	○	○	○
C. Your county	○	○	○	○	○
D. Your farm	○	○	○	○	○

13. Below are some statements about water quality. **Check the circle that comes closest to your own opinion about each.**

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
The farming practices I currently use have no significant impact on water quality in my local community.	○	○	○	○	○
Farming practices are readily available to me that will help protect water quality in my local community.	○	○	○	○	○
I personally feel a great responsibility to do whatever I can to help protect the water quality of my local community.	○	○	○	○	○
There's a definite possibility that I now have a significant water quality problem on my own land.	○	○	○	○	○
If I don't begin using water quality protection practices on my own, the government will force me to use them through legislation and regulation.	○	○	○	○	○

14. Next, consider the following information sources. **Please check ✓ how often you use each of the sources** to help make decisions about your farming operation.

HOW OFTEN do you use each of the print information sources below?

	Always	Frequently	Sometimes	Seldom	Never
A. General daily or weekly newspapers	○	○	○	○	○
B. Farm newspapers	○	○	○	○	○
C. General farm magazines (such as Farming, Farm Journal, Successful Farming)	○	○	○	○	○
D. Specialized farm magazines (such as Feed Stuffs, Crops and Soils)	○	○	○	○	○
E. Extension publications	○	○	○	○	○
F. Monocacy River Watershed Project publications	○	○	○	○	○
G. Private newsletters (such as Doane's, Pro Farmer)	○	○	○	○	○

HOW OFTEN do you use each of the electronic information sources below?

	Always	Frequently	Sometimes	Seldom	Never
H. General TV or radio news	○	○	○	○	○
I. TV farm programs	○	○	○	○	○
J. Radio farm programs	○	○	○	○	○

HOW OFTEN do you use each of the organizational information sources below?

	Always	Frequently	Sometimes	Seldom	Never
K. Farm meetings, workshops, courses	○	○	○	○	○
L. Farm demonstrations or field days	○	○	○	○	○
M. Monocacy River Watershed Project demonstration farms	○	○	○	○	○

HOW OFTEN do you use each of the interpersonal information sources below?

	Always	Frequently	Sometimes	Seldom	Never
N. Farm supply dealers, salespeople, buyers, contractors or processors	○	○	○	○	○
O. Independent consultants	○	○	○	○	○
P. Extension agents or University specialists	○	○	○	○	○
Q. Soil or water conservation agents	○	○	○	○	○
R. Farm lenders	○	○	○	○	○
S. Landlords, tenants	○	○	○	○	○
T. Family members or partners	○	○	○	○	○
U. Other farmers	○	○	○	○	○

15. Information is needed for different kinds of farming decisions. Which sources on the opposite page do you find most useful for each of the following specific purposes?

Just write in the letter of the source from the opposite page.

	Most useful	2nd Most useful
Day-to-day farm production decisions		
Long-range production or marketing plans		
First hearing about new farm practices		
Evaluating how worthwhile new farm practices are before deciding to try them		
Learning how to try out new farm practices		
Choosing the best nutrient and pest management practices for my crops		
Choosing the best manure management practices for my farm operation		
Finding out about the nature and extent of water quality problems in my local community		

16. We listed the Monocacy River Watershed Project as a source on the opposite page. **Prior to now,** had you heard about or were you aware of this project?

- ◯ No ➡ **Go to Question 20.**
- ◯ Can't recall ➡ **Go to Question 20.**
- ◯ Yes

17. How did you **first** find out about this project? **Write in the letter of the source from the opposite page.**

18. Were you aware that the Monocacy River Watershed Project sponsors farm demonstrations in your local area?

- ◯ No ➡ **Go to Question 19.**
- ◯ Yes

Have you visited or attended any of those farm demonstrations or related activities? ◯ No ◯ Yes

19. Up to now, how much influence, if any, has this project had on how you run your farming operation?

◯ None — ◯ A little — ◯ Some — ◯ A fair amount — ◯ A great deal

20. Have you ever had a problem with water pollution on your own land?

- ◯ No ➡ **Go to Question 21.**
- ◯ Yes

Please check ✓ all that apply.

- ◯ Nitrates in drinking water
- ◯ Pesticides in drinking water
- ◯ Bacteria in drinking water
- ◯ Poor taste of drinking water
- ◯ Cloudiness of drinking water
- ◯ Muddy surface water from erosion
- ◯ Too many weeds in surface water
- ◯ Poor fish quality or numbers

21. Within the past year, have you changed a production or management practice mainly because you thought it would help protect water quality?

- ◯ No ➡ **Go to Question 22.**
- ◯ Yes, I have changed **Check ✓ all that apply.**

- ◯ Rate or type of nutrient input
- ◯ Rate or type of pesticides used
- ◯ Pesticide storage and handling practices
- ◯ Field practices to include more conservation practices
- ◯ Protection of drinking wells
- ◯ Fencing to keep livestock out of surface waters
- ◯ Timing of nutrient inputs
- ◯ Pest scouting and other IPM practices
- ◯ Tillage to a conservation tillage system
- ◯ Management to include the services of a crop consultant
- ◯ Manure storage facilities
- ◯ Manure application

What about your farming practices?

Now, we would like to ask you about three specific farm management practices, even if you don't use them on your farm.

Manure Crediting refers to estimating the amount of nutrients available for crops from applying livestock or poultry manure. The rate of commercial fertilizer applied is then adjusted by the amount provided by manure.

22. Prior to now, were you aware of manure crediting as just described?

- ○ No → **Go to Question 24.**
- ○ Yes ↓

23. How familiar are you with how to use manure crediting? **Check the circle ✓ that best applies.**

○ Unfamiliar ○ Somewhat familiar ○ Familiar ○ Mostly familiar ○ Completely familiar

Legume Crediting refers to estimating the amount of nitrogen available for crops from previous legumes (such as alfalfa, clover, cover crops, peas or beans). The rate of commercial fertilizer is then adjusted by the amount of nitrogen provided by the legumes.

24. Prior to now, were you aware of legume crediting as just described?

- ○ No → **Go to Question 26.**
- ○ Yes ↓

25. How familiar are you with how to use legume crediting? **Check the circle ✓ that best applies.**

○ Unfamiliar ○ Somewhat familiar ○ Familiar ○ Mostly familiar ○ Completely familiar

Split Application of Nitrogen refers to applying one-half or less of the required amount of nitrogen for corn production at or before planting, and applying the remainder after the corn emerges.

26. Prior to now, were you aware of split application of nitrogen as just described?

◯ No → **Go to Question 28.**
◯ Yes

↓

27. How familiar are you with how to use split application? **Check the circle ✓ that best applies.**

◯ Unfamiliar — ◯ Somewhat familiar — ◯ Familiar — ◯ Mostly familiar — ◯ Completely familiar

Please use the list of information sources below to answer the next three questions. If you haven't heard of the practice, please go to the next practice.

Fill in a letter in the box.

28. From which one of the sources below have you mainly heard or read about **manure crediting**? ☐

29. From which one of the sources below have you mainly heard or read about **legume crediting**? ☐

30. From which one of the sources below have you mainly heard or read about **split application** of nitrogen? ☐

A. General daily or weekly newspapers
B. Farm newspapers
C. General farm magazines
D. Specialized farm magazines
E. Extension publications
F. Monocacy River Watershed Project publications
G. Private newsletters
H. General TV or radio news
I. TV farm programs
J. Radio farm programs
K. Farm meetings, workshops, courses
L. Farm demonstrations or field days
M. Monocacy River Watershed Project demonstration farms
N. Farm supply dealers, salespeople, buyers, contractors or processors
O. Independent consultants
P. Extension agents or University specialists
Q. Soil or water conservation agents
R. Farm lenders
S. Landlords, tenants
T. Family members or partners
U. Other farmers

31. Please evaluate the following practices even if you don't use or know little about them. **Check the circle ✓ that best applies for each practice.**

How EXPENSIVE is it to use each of the following practices?

	High expense	Moderate expense	Low expense	No expense	Don't know
Manure Crediting: Reducing the rate of commercial fertilizer based on nutrients in manure application	○	○	○	○	○
Legume Crediting: Reducing the rate of commercial fertilizer based on nutrients in prior legume credits	○	○	○	○	○
Split Application of Nitrogen: Applying less than full rates of nitrogen at several points during the year.	○	○	○	○	○

How much of your CURRENT FARM LABOR is required to use each of these practices?

	Would require additional workers	More work for existing labor	No change in labor	Less labor	Don't know
Manure Crediting:	○	○	○	○	○
Legume Crediting:	○	○	○	○	○
Split Application of Nitrogen:	○	○	○	○	○

How COMPLEX is it to use each of the following practices in your farming operation?

	Very complex	Complex	Somewhat complex	Not complex	Don't know
Manure Crediting:	○	○	○	○	○
Legume Crediting:	○	○	○	○	○
Split Application of Nitrogen:	○	○	○	○	○

How DIFFICULT are the management decisions for each of the following practices?

	Very difficult	Difficult	Somewhat difficult	Not difficult	Don't know
Manure Crediting:	○	○	○	○	○
Legume Crediting:	○	○	○	○	○
Split Application of Nitrogen:	○	○	○	○	○

How PRACTICAL are each of these practices in your current farming operation?

	Very practical	Practical	Somewhat practical	Not practical	Don't know
Manure Crediting:	○	○	○	○	○
Legume Crediting:	○	○	○	○	○
Split Application of Nitrogen:	○	○	○	○	○

How RISKY is it to use each of these practices in your farming operation?

	High risk	Medium risk	Low risk	No risk	Don't know
Manure Crediting:	○	○	○	○	○
Legume Crediting:	○	○	○	○	○
Split Application of Nitrogen:	○	○	○	○	○

How can the following practices affect water quality ON YOUR FARM?

	Improve water quality	Prevent but not improve problems	Not hurt or help	Cause more pollution	Don't know
Manure Crediting:	○	○	○	○	○
Legume Crediting:	○	○	○	○	○
Split Application of Nitrogen:	○	○	○	○	○

How can the following practices affect water quality IN YOUR LOCAL COMMUNITY?

	Improve water quality	Prevent but not improve problems	Not hurt or help	Cause more pollution	Don't know
Manure Crediting:	○	○	○	○	○
Legume Crediting:	○	○	○	○	○
Split Application of Nitrogen:	○	○	○	○	○

How can each of the following practices INFLUENCE FARM PROFITABILITY?

	Increase profits	No change in profits	Decrease profits	Don't know
Manure Crediting:	○	○	○	○
Legume Crediting:	○	○	○	○
Split Application of Nitrogen:	○	○	○	○

How EASY is it to find out about each of the following practices?

	Very easy	Somewhat easy	Not easy	Don't know
Manure Crediting:	○	○	○	○
Legume Crediting:	○	○	○	○
Split Application of Nitrogen:	○	○	○	○

Which information source is the MOST INFLUENTIAL in making a decision about using each of the following practices in your farming operation?

	Extension or soil conservation agents, government or university sources	Farm supply dealers, salespeople, consultants, lenders or buyers	Farm magazines, newspapers, newsletters, radio and TV	General news media (TV, radio, newspaper)	Conversations with family, friends, or other farmers
Manure Crediting:	○	○	○	○	○
Legume Crediting:	○	○	○	○	○
Split Application of Nutrients:	○	○	○	○	○

32. Please read the following statements. **Check the circle ⊘ that best describes whether you agree, disagree, or don't know about each.**

	Agree	Disagree	Don't know
On average, each ton of solid dairy manure can provide 9 pounds of nitrogen per acre the first year after application.	O	O	O
Manure applications alone can meet the total nutrient needs of a high yielding corn crop.	O	O	O
Plowing down a good (75% or better) stand of alfalfa can provide all the nitrogen needed to produce a corn crop of 85 bushels per acre.	O	O	O
Variability in nitrogen release makes legume plowdown an unreliable source of nitrogen for row-crop production.	O	O	O
The most rapid nitrogen uptake by corn occurs 6 to 12 weeks after planting.	O	O	O
An advantage of split applications of fertilizer is that it reduces the amount of nitrogen lost below the crop root zone.	O	O	O
Current soil testing (routine soil analysis) of the plow layer measures how much nitrogen is in the soil.	O	O	O

33. How many of your tillable acres were planted to corn in 1991?
Please fill in the number of acres.

[ ] Corn acres

34. How many of the following livestock did you own or manage over the past 12 months? **If you did not have any livestock, go to Question 48.**

Dairy Cattle

Estimate average dairy herd size across the past 12 months in each of these categories:

[ ] Cows

[ ] Heifers/ replacement stock

[ ] Calves/ young stock

Beef Cattle (Including young stock)

Estimate average beef herd size across the past 12 months:

[ ] Animals

Which best describes your beef operation.

- ○ Cow/calf
- ○ Feeder
- ○ Cow/calf and feeder

Approximately how many animals did you market in the past 12 months?

[ ] Animals

Poultry

Estimate average flock size across the past 12 months:

[ ] Birds

Which best describes your operation?

- ○ Layers
- ○ Broilers
- ○ Turkeys

Approximately how many birds did you market in the past 12 months?

[ ] Birds

Hogs

Estimate average number of hogs across the past 12 months:

[ ] Animals

Which best describes your operation?

- ○ Farrow, sell feeder pigs
- ○ Feeder-to-finish
- ○ Farrow-to-finish

Approximately how many animals did you market in the past 12 months?

[ ] Animals

35. Which of the following types of manure management describes your farm situation? **Check ✓ all that apply.**

- ○ Daily or frequently hauled
- ○ Daily or frequently hauled except in winter
- ○ Pile the manure on the ground
- ○ Pile the manure on concrete slab
- ○ Store solid manure in concrete pit
- ○ Store as liquid in concrete pit or slurry system
- ○ Store in a clay-lined lagoon
- ○ Store in an unlined lagoon
- ○ Store in pre-cast concrete pit
- ○ Store solid manure in concrete pit with ramp
- ○ Livestock kept on pasture
- ○ Spread when cleaning livestock facilities

36. Do you have a manure storage facility?

○ No → **Go to Question 37.**

○ Yes ↓

A. What is the capacity of your manure storage facility in months or days?

[ ] Months capacity **OR** [ ] Days capacity

B. Indicate the months when you apply manure from your storage facility.

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
○	○	○	○	○	○	○	○	○	○	○	○

37. How much do you estimate it would cost to build a manure storage facility for your farm?

$ [ ]

38. Is there government cost-share assistance available to help farmers construct manure storage facilities in your area?

○ No → **Go to Question 40.** ○ Yes ○ Not sure

39. Have you or will you receive government cost-share assistance to build a manure storage facility?

○ No ○ Yes

40. For the following crops, please estimate the number of acres where manure was applied within one year prior to planting in 1991.
For each crop, fill in the acres and check ✓ all that apply.

I applied manure on __ __,__ __ __ acres of **CORN** in the:	I applied manure on __ __,__ __ __ acres of **ALFALFA /HAY** in the:
○ Fall ('90)	○ Fall ('90)
○ Winter ('90-91)	○ Winter ('90-91)
○ Spring ('91)	○ Spring ('91)
○ Summer ('91)	○ Summer ('91)

I applied manure on __ __,__ __ __ acres of **SMALL GRAINS** in the:	I applied manure on __ __,__ __ __ acres of **OTHER CROPS** in the:
○ Fall ('90)	○ Fall ('90)
○ Winter ('90-91)	○ Winter ('90-91)
○ Spring ('91)	○ Spring ('91)
○ Summer ('91)	○ Summer ('91)

41. What type of manure spreading equipment do you presently use?
Check ✓ all that apply.

	Own	**Rent, lease or custom hire**
Conventional box type	○	○
V-bottom, side delivery	○	○
Barrel side delivery, flail type	○	○
Liquid, with injection	○	○
Liquid, without injection	○	○

42. Did you practice **manure crediting** for corn production in 1991? That is, on those fields where manure was applied, did you adjust the amount of commercial fertilizer by the amount provided by manure?

- ◯ No ➡ **Go to Question 48.**
- ◯ Yes

43. On how many corn or small grain acres did you adjust commercial fertilizer due to manure applications within the last 12 months?

☐ Corn acres ☐ Small grain acres

44. Think of your overall most productive corn field to which manure has been applied within the last 12 months. On this field, how many pounds did you reduce applications of nitrogen (N) per acre due to **manure crediting** in 1991?

☐ Pounds per acre reduction of commercial nitrogen fertilizer

45. What is the size of this most productive corn field?

☐ Acres

46. Please estimate the capacity of the manure spreader used on your most productive corn field.

☐ Tons per load

OR

☐ Gallons per load

OR

☐ Bushels per load

47. Now, please estimate the number of loads of manure spread on this most productive corn field within 12 months of planting in 1991.

☐ Loads per acre of

- ◯ Dairy/beef manure
- ◯ Hog manure
- ◯ Poultry manure

48. Did you buy or get manure from off-farm sources over the past 12 months?

○ No ○ Yes

49. How many acres did you have in legumes such as alfalfa, clover, soybeans, or peas in 1990? **If no legumes were grown in 1990, go to Question 51.**

[ ] Acres

50. Of these acres in legumes in 1990, how many were rotated to corn in 1991?

[ ] Acres

51. Did you practice **legume crediting** for corn production in 1991? That is, on those corn fields coming out of a legume rotation, did you adjust the amount of commercial fertilizer applied by the amount provided by legumes?

○ No → **Go to Question 55.**
○ Yes ↓

52. On how many of your corn acres rotated from legumes did you adjust the amount of commercial fertilizer due to legume crediting?

[ ] Corn acres

53. Think of your most productive corn field rotated from legumes to corn in 1991. Which legume was grown on this field in 1990?

○ Alfalfa ○ Soybeans
○ Clover ○ Other

54. On this most productive corn field in rotation, did you adjust your application of commercial nitrogen fertilizer based on the amount of nitrogen available from the previous legume crop?

○ No → **Go to Question 55.**
○ Yes ↓

On average, how much did you reduce nitrogen application in 1991?

[ ] Pounds of nitrogen per acre

55. Again, **split application** refers to applying portions of the required nitrogen at several points during the year. Did you split-apply nitrogen fertilizer on corn in 1991?

- ◯ No ➡ **Go to Question 56.**
- ◯ Yes ⬇

On how many of your corn acres did you split-apply nitrogen?

[ ] Acres

56. On average, when and at what rates did you apply commercial nitrogen fertilizer on your overall most productive corn field? **Fill in all that apply.**

	Rate in pounds of Nitrogen/acre per application		Check ✓ if applied by irrigation
Fall 1990	[ ]	lbs/acre	◯
Early Spring 1991 (pre-plant, at planting or pre-emerge)			
1st application	[ ]	lbs/acre	◯
2nd application	[ ]	lbs/acre	◯
Spring/Summer 1991 (post-emergence)			
1st application	[ ]	lbs/acre	◯
2nd application	[ ]	lbs/acre	◯
3rd application	[ ]	lbs/acre	◯

What about yourself?

The few remaining questions are about you and the land you farm or manage. **Please remember all of your answers will be kept confidential.** We need to ask these questions so that programs can be designed to better serve your needs. These questions are like those asked in the USDA Census of Agriculture.

57. What was your age at your last birthday? ☐ Years

58. What is the highest level of formal education you have completed? **Check the circle that applies, and check in the box below if it was related to agriculture.**

- ○ Grade school
- ○ Some high school
- ○ High school diploma
- ○ Some college work
- ○ Some vocational technical work
- ○ 2 year associate degree
- ○ 4 year college degree
- ○ Some post graduate work
- ○ Post graduate degree

☐ Yes, it was related to agriculture.

59. How would you describe your race? **Check the circle that applies.**

- ○ White
- ○ American Indian
- ○ Other (Please specify: ______________________________)
- ○ Black or African-American
- ○ Asian or Pacific Islander

60. Are you Hispanic or of Spanish origin or descent?

○ No ○ Yes

61. Did you grow up on a farm?

○ No ○ Yes

62. How many years have you farmed?

[ ] Years

63. Of your working time in 1991, did you spend at least half of your time working on a farm?

◯ No ◯ Yes

64. What is the legal form of your farm business? **Check the circle ✓ that applies.**

◯ Individual or Joint Husband-Wife Proprietorship
◯ Family Partnership
◯ Family Corporation
◯ Non-family Partnership
◯ Non-family Corporation
◯ Other

65. How long have you been making most of the decisions on this farm ?

[ ] Years

66. How many total acres did you operate in 1991?

[ ] Acres

Of these acres, how many acres did you own or rent in each of the following categories in 1991?

	Acres Operated in 1991	
	Owned	Rented
Croplands (including CRP set-aside)	___,___ ___ ___	___,___ ___ ___
Permanent pasture	___,___ ___ ___	___,___ ___ ___
Woodland	___,___ ___ ___	___,___ ___ ___
Other	___,___ ___ ___	___,___ ___ ___

Now, think about all of the land currently leased or rented from other people. If you have more than one lease, we want you to think only of your most important lease. **If you don't rent land, go to Question 70.**

67. In general, **how much influence** does your landlord have on your rented land with respect to the following activities? **Check the circle that best applies.**

A. Crops produced

○ None ○ A little ○ Some ○ A fair amount ○ A great deal

B. Fertilizers used

○ None ○ A little ○ Some ○ A fair amount ○ A great deal

C. Weed and insect control

○ None ○ A little ○ Some ○ A fair amount ○ A great deal

D. Method of tillage

○ None ○ A little ○ Some ○ A fair amount ○ A great deal

E. Participation in government programs

○ None ○ A little ○ Some ○ A fair amount ○ A great deal

68. How long have you leased the land on your most important lease?

[ ] Years

69. How would you describe this most important lease?

○ It is a written lease
○ It is an oral lease (verbal agreement)
○ Other

70. In 1991, approximately what percentage of labor on your farm was provided by the following sources?

Myself		percent
Family labor (from my household)		percent
Family labor (living outside of my household)		percent
Non-family, full-time employees (200 or more full days per year)		percent
Seasonal or part-time employees (less than 200 full days per year)		percent
Custom labor		percent
All sources should total 100 percent	**100**	**percent**

71. During which months, if any, are you most likely to experience major labor shortages? **Check ✓ all that apply.**

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
○	○	○	○	○	○	○	○	○	○	○	○

72. For which of the following activities, if any, do you experience labor shortages? **Check ✓ all that apply.**

- ○ Plowing and Field Preparation
- ○ Planting
- ○ Fertilizer Application
- ○ Cultivating
- ○ Weed and Insect Control
- ○ Irrigation
- ○ Harvesting (hay only)
- ○ Harvesting (row crops)
- ○ Milking
- ○ Livestock Feeding
- ○ Manure Hauling

73. If you started using a new technique or practice that required the use of additional labor, where would you **first** go to get this labor? **Check the circle ✓ that applies.**

- ◯ Myself
- ◯ My family
- ◯ Hired labor
- ◯ I would not adopt the practice if it required more labor

74. What problems, if any, do you have in hiring additional labor? **Check ✓ all that apply.**

- ◯ I have no problems
- ◯ I can't afford to hire more labor
- ◯ There are not enough people in my area willing to do farm work
- ◯ There are too many better non-farm job opportunities in my area
- ◯ I don't like to hire laborers in general

75. What are your plans for the next 5 years? **Check ✓ all that apply.**

- ◯ I plan major expansions in my operation
- ◯ I plan to make a few expansions in my operation
- ◯ I plan to continue about the same as now
- ◯ I plan to make a few reductions in my operation
- ◯ I plan major reductions in my operation
- ◯ I plan to quit farming within the next five years

Who will take over the farm after you?

- ◯ Immediate family
- ◯ Other relatives
- ◯ Neighboring farmer
- ◯ Other farmer
- ◯ Non-farmers or developers
- ◯ I don't know

76. In 1991, what was your **gross farm income?** (Gross farm income includes sales of agricultural commodities, rental income from agricultural land, government payments, etc.) **Check the circle that applies.**
Please remember your answers are confidential.

- ○ Less than $2,500
- ○ $2,500 - $9,999
- ○ $10,000 - $24,999
- ○ $25,000 - $49,999
- ○ $50,000 - $99,999
- ○ $100,000 - $249,999
- ○ $250,000 - $499,999
- ○ $500,000 - $999,999
- ○ $1,000,000 - $1,999,999
- ○ More than $2 million

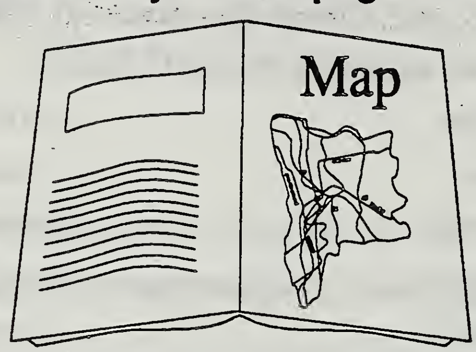
77. Approximately what percent of your 1991 **gross farm Income** came from each of the following categories?

Income Source	Percent Gross Income
Sale of dairy products	____ percent
Sale of livestock	____ percent
Sale of poultry products	____ percent
Sale of cash grains	____ percent
Sale of fresh produce	____ percent
Sale of processing or canning crops	____ percent
Sale of specialty crops	____ percent
Government program payments	____ percent
Rental income from agricultural land	____ percent
Other	____ percent
Should total 100 percent	**100 percent**

78. Approximately what percent of your **total household income** came from off-farm sources in 1991?

____ %

For the last few questions, please use the map on the cover of this booklet. Just unfold the survey so this page is facing the color map.



1. On the map found on the page to the right (⟶), put a clear and dark **"X"** on the approximate location of where you live.

Your Home X ⟶

If the location is not on the map, write the letter along the edge of the map with an arrow pointing in the general direction.

2. Now put an **"F"** on the approximate location of the fertilizer dealer where you make most of your purchases.

Your Fertilizer Dealer F ⟶

3. Now put a **"P"** on the approximate location of the pesticide (herbicides and insecticides) dealer where you make most of your purchases.

Your Pesticide Dealer P ⟶

4. Now put an **"S"** on the approximate location where you sell most of your farm products.

Where You Sell Products S ⟶

5. Now put a **"M"** on the approximate location of the farm machinery dealer you use the most.

Your Machinery Dealer M ⟶

6. If you also are employed off your farm, please put a **"W"** on the approximate location of your off-farm work.

Your Off-Farm Work W ⟶

APPENDIX B.1

Communication Strategy Questionnaire
University of Wisconsin
Water Quality Demonstration Project Evaluation

This questionnaire is being sent to information and education specialists with responsibilities on the USDA water quality demonstration projects in the eight project states. The research team at the University of Wisconsin is interested in learning about the different means and media the involved agencies use to communicate with their audiences. The information we receive from you will help us track the influences of communication channels and strategies on farmers' decisions to adopt water quality best management practices.

Below, please indicate the methods you will use to communicate with your audiences. For each method, please indicate whether you will not use it at all (0), use it only a little (1), somewhat (2), or a great deal (3).

PUBLIC MEDIA	USE
Written news releases or features sent to:	
- area daily newspapers	0 1 2 3
- area weeklies	0 1 2 3
- statewide or regional dailies	0 1 2 3
- ag magazines	0 1 2 3
- other magazines (specify below)	0 1 2 3
- area radio stations	0 1 2 3
- area television stations	0 1 2 3
- county agents to distribute	0 1 2 3
- other -- specify: ____________	0 1 2 3
______________________	
______________________	
Audio news releases, features sent to radio stations	0 1 2 3
Video news releases, features sent to television stations	0 1 2 3

0 = not use at all   1 = use only a little   2 = somewhat   3 = use a great deal

PUBLIC MEDIA cont...	USE
Written or personal contact made to solicit news coverage from:	
- area daily newspapers	0 1 2 3
- area weeklies	0 1 2 3
- statewide or regional dailies	0 1 2 3
- ag magazines	0 1 2 3
- other magazines (specify below)	0 1 2 3
- area radio stations	0 1 2 3
- area television stations	0 1 2 3
- other -- specify: ______________ ______________ ______________	0 1 2 3
Prepared public service announcements sent to:	
- area daily newspapers	0 1 2 3
- area weeklies	0 1 2 3
- statewide or regional dailies	0 1 2 3
- ag magazines	0 1 2 3
- other magazines (specify below)	0 1 2 3
- area radio stations	0 1 2 3
- area television stations	0 1 2 3
- other -- specify: ______________ ______________ ______________	0 1 2 3
Participation sought on radio public affairs, talk, interview programs	0 1 2 3
Participation sought on television public affairs, talk, interview programs	0 1 2 3

CONTROLLED MEDIA	USE
Pamphlets or brochures printed for this project by: ______________________	0 1 2 3
Previously available Extension/USDA/SCS/ASCS materials	0 1 2 3
Newsletters	0 1 2 3
Instructional Materials	0 1 2 3
Informal handouts, flyers	0 1 2 3
Posters	0 1 2 3
Signs	0 1 2 3
Direct mail pieces to producers	0 1 2 3
Slide or multi-media presentation materials	0 1 2 3
Overheads or related materials	0 1 2 3
Audio-tape or cassette presentations	0 1 2 3
Video cassette presentations	0 1 2 3
Film presentations	0 1 2 3
Display or exhibit materials (e.g., for demonstration farms, fairs)	0 1 2 3
Telephone teleconferencing presentations	0 1 2 3
Video satellite teleconferencing presentations	0 1 2 3
Pre-recorded telephone (dial access) information messages	0 1 2 3
Computer simulation or related software development	0 1 2 3

(CONT...)

NOW, would you please look back over the list and circle the three methods you will depend on the most over the course of the project.

Comments: If you have any questions or concerns you would like the University of Wisconsin research team to be aware of as we proceed with this project, please indicate below, or call Susan Smetzer at 608/265-2136.

PLEASE ATTACH TO THIS QUESTIONNAIRE YOUR NEWS RELEASE DISTRIBUTION LIST, IF ONE IS AVAILABLE.

Thank you for completing this questionnaire. We appreciate the time and energy required to provide this information.

Please return this questionnaire with accompanying attachments to:

Susan M. Smetzer
Research Assistant
Department of Agricultural Journalism
University of Wisconsin
440 Henry Mall
Madison, WI 53706

North Carolina Media Questionnaire

We would like to ask farmers about the types of media they use in gathering information to make farming decisions. To do this, we have compiled a list of media that we think cover the water quality demonstration and comparison areas. We need your help in verifying if we have included all possible sources and how important they are to farmers.

First, we would like you to estimate, on a scale of 1 to 5, **how likely it is that farmers in your area actually receive the medium.** In **Column A**, please rate the likelihood of farmers in your area receiving the medium. A **5** indicates it is **very likely** the majority of farmers in your area receive this media. A **1** says it is **very unlikely** the majority of farmers in your area use this medium. If you **don't know**, please put a **0** in **Column A.**

Next, in **Column B** please tell us **how much you think farmers rely upon this medium for agricultural information.** Again, a **5** means it is **very likely** the farmers in your area rely upon the medium for agricultural information. A **1** says it is **very unlikely** farmers rely upon the medium. If you **don't know**, please put a **0** in **Column B**

In **Column C**, please indicate **the likelihood that the medium will cover the water quality Best Management Practices with which we are concerned.** This time a **5** means the medium is **very likely** to cover Best Management Practices associated with the water quality demonstration project, while a **1** means it is **very unlikely** that the medium will cover Best Management Practices. If you **don't know**, please put a **0** in **Column C.**

And finally, in **Column D** indicate **which of these media are likely to be used in the Best Management Practice information campaign planned for your demonstration area.** A **5** indicates the medium is **very likely** to be used in information dissemination. A **1** says the medium is **very unlikely** to be used as a channel. If you **don't know**, please put a **0** in **Column D.**

Space has been provided at the end of each type of media for you to include additional, relevant media that we missed. Please print the name of the medium and fill in columns A through D.

1 = Very Unlikely 5 = Very Likely 0 = Don't Know

AGRICULTURAL MAGAZINES

	Column A Receive Magazine	Column B Rely on Magazine	Column C Covers BMP's	Column D Use in Project
Agri Finance				
Agrichemical Age				
Agricultural Review				
American Vegetable Grower				
Carolina Farmer				
Cooperative Farmer				
Farm Family America				
Farm Futures				
Farm Impact				
Farm Industry News				
Farm Journal				
Farm Progress Group				
Farm Forum				
Farmland News				
The Furrow				
Hay & Forage				
Hog Farm Management				
Hogs Today				
Intl. Poultry Trade Show Guide				
Journal of Soil & Water Conservation				
National Hog Farmer				
The New Farm				
North Carolina Farm Bureau News				
Pork '90				
PorkReport				
Poultry Digest				
Poultry Times				

1 = Very Unlikely 5 = Very Likely 0 = Don't Know

AGRICULTURAL MAGAZINES, CONT.

	Column A Receive Magazine	Column B Rely on Magazine	Column C Covers BMP's	Column D Use in Project
Progressive Farmer				
Southeast Farm Press				
Successful Farming				

Are there **other agricultural publications that provide information** to farmers in your area that we neglected to include? Please print the names of these publications below and fill in the columns as you did with the above publications.

OTHER AGRICULTURAL MAGAZINES

	Column A Receive Magazine	Column B Rely on Magazine	Column C Covers BMP's	Column D Use in Project

RADIO STATIONS

	Column A Receive Radio	Column B Rely on Radio	Column C Covers BMP's	Column D Use in Project
WCLN 1170 AM				
WCLN 107.1 FM				
WRRZ 880 AM				
WELS 1010 AM				
WISP 1230 AM				
WKCP 97.7 FM				
WKNS 90.5 FM				
WRNS 960 AM				

1 = Very Unlikely 5 = Very Likely 0 = Don't Know

RADIO STATIONS

	Column A Receive Radio	Column B Rely on Radio	Column C Covers BMP's	Column D Use in Project
WRNS 95.1 FM				
WFAI 1230 AM				
WFLB 1490 AM				
WFNC 640 AM				
WQSM 98.1 FM				
WFSS 89.1 FM				
WIDU 1600 AM				
WZFX 99.1 FM				
WFMC 730 AM				
WFXN 1300 AM				
WGBR 1150 AM				
WKTC 96.9 FM				
WOKN 102.3 FM				
WTRQ 1560 AM				

Are there other radio stations that provide information to farmers in your area that we neglected to include? Please print the names of these radio stations below and fill in the columns as you did with the above radio stations.

OTHER RADIO STATIONS

	Column A Receive Radio	Column B Rely on Radio	Column C Covers BMP's	Column D Use in Project

1 = Very Unlikely 5 = Very Likely

TELEVISION STATIONS

	Column A Receive Television	Column B Rely on Television	Column C Covers BMP's	Column D Use in Project
WWAY CHANNEL 3				
WECT CHANNEL 6				
WITN CHANNEL 7				
WTVD CHANNEL 11				
WRAL CHANNEL 5				
WPTF CHANNEL 28				
WLFL CHANNEL 22				
WCTI CHANNEL 12				
WNCT CHANNEL 9				
WYED CHANNEL 17				
WKFT CHANNEL 40				

Are there **other television stations that provide information** to farmers in your area that we neglected to include? Please print the names of these television stations below and fill in the columns as you did with the above television stations.

OTHER TELEVISION STATIONS

	Column A Recive Television	Column B Rely on Television	Column C Covers BMP's	Column D Use in Project

1 = Very Unlikely 5 = Very Likely 0 = Don't Know

NEWSPAPERS

	Column A	Column B	Column C	Column D
	Receive Newspaper	Rely on Newspaper	Covers BMP's	Use in Project
THE SAMPSON INDEPENDENT				
FAYETTEVILLE TIMES				
FAYETTEVILLE OBSERVER				
FAYETTEVILLE OBSERVER-TIMES				
GOLDSBORO NEWS-ARGUS				
DAILY NEWS				

Are there **other newspapers that provide information** to farmers in your area that we neglected to include? Please print the names of these newspapers below and fill in the columns as you did with the above newspapers.

OTHER NEWSPAPERS

	Column A	Column B	Column C	Column D
	Receive Newspapers	Rely on Newspaper	Covers BMP's	Use in Project

United States Department of Agriculture | Cooperative Extension Service, University of Maryland System | Soil Conservation Service | Agricultural Stabilization and Conservation Service

Frederick Soil Conservation District | Carroll Soil Conservation District

Monocacy Watershed Farmer

Vol. 1, No. 1 April, 1991

Farmers in Monocacy Watershed Handle Animal Waste Using Different Approaches

A Profile of Two Farmers Who Are Making It Work

The management of animal waste presents a dilemma for a lot of farmers. While they bend over backwards to help in water quality programs, and have no desire to contribute to problems that foul up watersheds, they still have to make a living.

But, animal waste management programs are vital to watershed protection and the restoration of the Chesapeake Bay. According to studies that have now been completed in the Chesapeake Bay watersheds—including those from the states of Maryland, Virginia, Pennsylvania, Delaware, New York and the District of Columbia—animal waste is contributing to poor water quality and loss of aquatic habitat in watershed rivers and the Bay.

The federally funded Monocacy Demonstration Area Program is one example of a program that is attempting to clean up the water. There are many farmers cooperating in this program, and they are using several different systems to capture animal waste.

The main concern of fourth generation farmer Charles "Chuck" Fry of Tuscarora, was keeping costs to a minimum. He installed a "no frills" earthen basin with concrete on the floor to collect animal waste on his dairy operation.

"I was interested in something that would pay for itself quickly," Chuck stated. "I received $13,500 in cost share which paid 85 percent of my costs for the pit. I received $10,000 from the Maryland MACS program and $1,350 from the Agricultural Stabilization and Conservation Service. I also had to invest in some different machinery such as a $6,000 spreader.

"However, I'm realizing a $40 load saving in fertilizer cost. I paid for my investment in the machinery the first year." he continued.

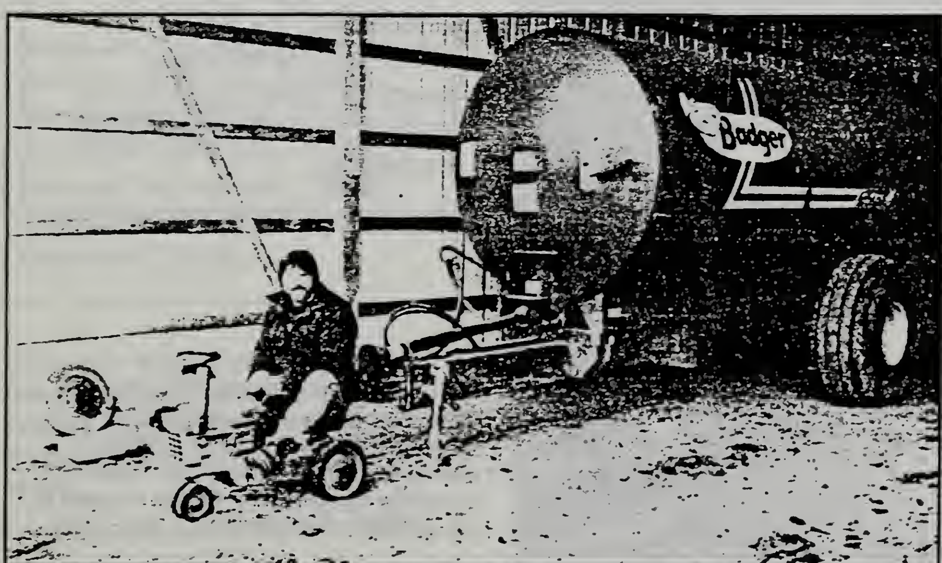
Chuck said there were several other benefits of the new manure pit.

"Before the pit, my soil compaction was terrible—especially when it would rain," he said. "However, now, I save the manure up in the pit, spread it when I need to, and...well, I can't believe the difference."

Chuck said with the constant soil testing that is done, he is spreading manure on fields that have never had it before. He has been experiencing the best corn he has ever had. He also grows wheat, barley, rye, and alfalfa.

"The manure from the pit is liquid," Chuck said. "With my new spreader, you just paint it on like a brush. I think it works better than the chemical fertilizers because it doesn't release everything all at once. I also turn in some of my cover crop. Sometimes when I have my soil tested, I don't need to spread anything on some of my fields. I'm saving a lot with this system."

Chuck has a smaller operation than a lot of farmers in Frederick County—about 200 head in total. "I like it that way," he said. "I want an



Chuck Fry demonstrates his agile ability to pull his new manure spreader with a toy tractor! Seriously, Chuck said he paid for the spreader within one year with the savings from his nutrient management plan. He is pleased with the results of his efforts and the increased production on some fields with soil testing and manure use.

operation that I can handle myself in just a number of hours. With this pit, I can clean the barn better, the cows have less disease, and it's making me money.

"I'm not into the big yields that a lot of farmers like. I look at my entire economic situation, the profitability factor. While some farmers boast about big yields—say 250 bushels of corn per acre, I look at my bottom line. My yield might not be 250 bushels of corn per acre. But if I come out in the black with enough left over for a halfway normal lifestyle plus a little vacation too during the winter, I'm perfectly happy with that."

Another farmer, Willard "Buzzy" Horton, of Mt. Airy, was reluctant to put in any kind of animal waste structure. The thing that sold him on doing it was the time and effort factor.

"My land is hilly," Buzzy said. "In the winter, it was the most amount of effort to spread manure every day. Yes! I had to do it everyday. I would scrape up the barn, put it in the spreader, and try to pull the spreader up these hills, rain, snow, shine, mud—whatever. I just don't have the room to stockpile it. What sold me was when they told me I'd just have to scrape the manure into the pit everyday and forget it. The pit would fill up every six months. Now it takes me 20 minutes to do the scraping and I'm finished. I have time to burn now."

Buzzy took his time deciding to put in a pit. He visited several other farmers who had them and looked at several different designs.

"I would be putting my pit on top of a hill since that is where my barn is located," he said. "I looked at several that I knew wouldn't work for me. By the time my pit was designed and installed, I felt I had the best design for my location. You have to know what you're putting into them, what you want to get out, how you're going to do it. I can tell you it pays to listen to people who have already done it. They know what you are in for, so don't turn them off."

The cost of the pit Buzzy settled on was $52,000. However, Buzzy received $35,000 in cost-sharing monies. He said he wouldn't have considered the pit without the cost share money.

Buzzy is now considering several other options to better manage his animal waste. He has agreed to try some test plots—using his system on some and the nutrient management system on some others.

"I'm still not convinced it will work," he said with a grin. "I'm willing to give it a try and will invite people to come and look if they want.

Buzzy is also putting in and redesigning some spring developments, and will be planting hay on his most erodible acreage. He also grows corn, alfalfa, barley and beans.

"I'm a reluctant cooperator," Buzzy said. "I listen a lot, and weigh the options, look at the results—some things don't work, you know. But when they do work—like my new pit up there, it gives you a good feeling. I actually like that idea now, even though at first I was skeptical. What appealed to me was not dragging around that spreader all winter. 'Course, now I've got to figure out how I'm going to spread the manure, come spring. That's the next challenge."

A Monocacy Team Member

Patty Engler

Patty Engler is the SCS coordinator for the Monocacy River Watershed Demonstration Project. She graduated from the University of Maryland with a degree in Agronomy Soils. She has worked with the Soil Conservation Service for three years. She also served as a Peace Corps Volunteer in the Philippines.

Buzzy Horton says he's a reluctant cooperator in the Monocacy Project. However, he has saved both time and money with a new manure pit. Instead of spreading manure daily, he lets it collect in the pit while he handles other farm duties.

A Monocacy Team Member

Thomas H. Miller

Tom works for the University of Maryland Cooperative Extension Service and is the Agronomist/ Field Coordinator for UMD in the Monocacy Project. Prior to being transferred to the Monocacy Project, Tom was the Water Quality Management/ Agricultural Science Extension Agent in Carroll County. Tom has been with UMD since 1976.

A Monocacy Team Member

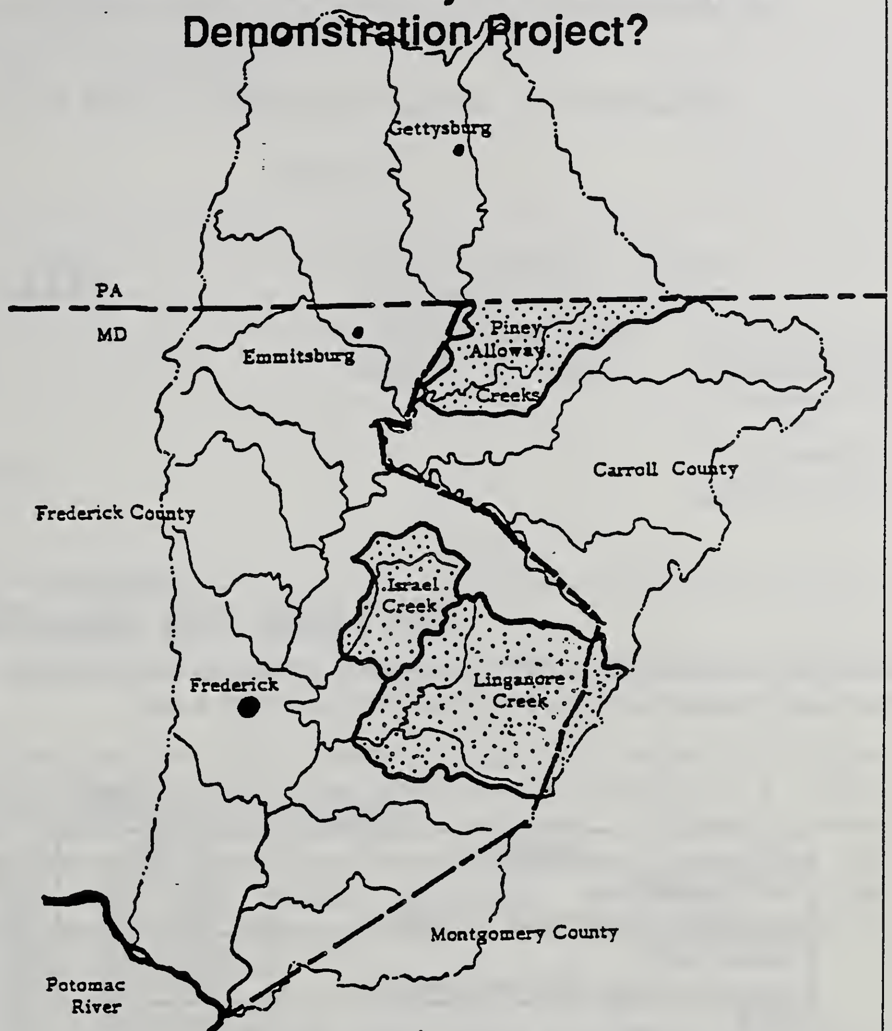
Patricia A. Burdette

Pat works with the University of Maryland Cooperative Extension Service. Prior to becoming a Nutrient Management Consultant on the Monocacy Project, Pat and her husband, Darby, dairy farmed for twelve years in Frederick County.

They say such nice things about people at their funerals that it makes me sad to realize that I'm going to miss mine by just a few days.

Garrison Keillor

What is the Monocacy River Watershed Demonstration Project?



The Monocacy River Watershed covers 774 square miles, or 476,200 acres. It includes portions of Carroll, Frederick and Montgomery counties and extends into Pennsylvania. The watershed was given top priority in the state by the Maryland Department of Agriculture because of its potential to release sediment and animal wastes from agricultural sources to the Potomac River and the Chesapeake Bay.

The primary objective of the Monocacy Project is to encourage wide-spread, voluntary adoption of management practices that will provide a cost effective means of reducing loadings of agricultural pollutants in surface and ground water resources.

The Maryland Monocacy Watershed Project is one of eight National water quality demonstration projects sponsored by the U.S. Department of Agriculture. It is a joint effort of the Maryland Cooperative Extension Service, the Soil Conservation Service, and the Agricultural Stabilization and Conservation Service in cooperation with the Frederick and Carroll Soil Conservation Districts.

The Monocacy River Watershed Water Quality Demonstration Project offers a combination of education programs, technical assistance and cost-sharing opportunities.

For more information, contact:

Monocacy Project Field Office
27 E. Frederick Street
Walkersville, MD 21793
(301) 898-0133 or
775-7434 (from Carroll County)

Non-Profit Org.
U.S. Postage
PAID
Permit No. 10
College Park, MD

Monocacy Project Office
27 East Frederick Street
Walkersville, MD 21793

TO:

Don't Miss This Opportunity!

ASCS has received $210,000 in cost-share money for the Monocacy River Watershed. You may be eligible for these monies but you won't know until you make a call.

Sources of Available Cost Shares

Agency	Contact	Maximum Cost Share
USDA/ASCS Agricultural Conservation Program	Jan Staley 622-1321	$3,500/Fiscal Year--$10,500/3 Year LTA *not to exceed 75% cost shares
USDA/SCS Linganore Creek Watershed Project	Patty Engler 473-4755	$25,000/Project--$100,000/Farm *not to exceed 65% cost share
MDA Maryland Agricultural Cost Share Program	Dawn Early 473-4755	$10,500/Project--$25,000/Farm *not to exceed 87.5% cost share

Approved Practices			C/S	Life
		Priority	Rate	Span
SL1	Permanent Vegetative Cover Establishment	High	60%	5 years
SL3	Stripcropping Systems	High	75%	10 years
SL5	Diversions	High	75%	10 years
SL6	Grazing Land Protection	High	50%	10 years
SL11	Permanent Vegetative Cover on Critical Areas	High	75%	5 years
WC1	Water Impoundment Reservoir	Low	50%	10 years
WL1	Permanent Wildlife Habitat	High	60%	5 years
WL2	Shallow water areas for wildlife	High	50%	10 years
WP1	Sediment Retention, Erosion, or Water	High	75%	10 years
WP2	Stream Protection System	High	50%	10 years
WP3	Sod Waterways	High	75%	10 Years
WP4	Agricultural Waste Control Facilities	High	75%	10 years
FR1	Forest Tree Plantations	High	65%	10 years
FR2	Forest Tree Stand Improvement	High	65%	10 years
SL8	Cropland Protective Cover (ICM)	High	50%	3 years
SP53	Integrated Crop Management (ICM)	High	75%	3 years

FLORIDA COOPERATIVE EXTENSION SERVICE
THE UNIVERSITY OF FLORIDA
INSTITUTE OF FOOD AND AGRICULTURAL SCIENCES

REPLY TO:

1303 17th St. West
Palmetto, FL 34221
(813) 722-4524
May 27, 1992

Ms. Susan Smetzer
USDA Water Quality Project
College of Agriculture
440 Henry Mall
University of Wisconsin - Madison
Madison, Wisconsin 53706

Dear Susan:

In response to our discussion of Tuesday, May 26 regarding the questions you and Dr. Nowak had about the watershed survey, I will try to briefly explain the relationship between growers and packinghouses in this area and the implications for results of surveys and projects such as the Water Quality Project. The following are my observations of changes in the industry and I believe they are relatively accurate.

Over the last 8 to 10 years, there has been a steady decline in the number of "independent" growers in this area. Some have gotten out of farming completely or left the area. Others have become "packinghouse growers" which I will explain later. There are several reasons for this change. One is the fluctuation in the market and prices over the last several seasons. It seems that the majority of the last few seasons have been losing seasons for the growers. At one time, we had distinct production districts within Florida and thus each area had its' own market window. (Major production areas include South Florida, Immokalee/Naples, Palmetto/Ruskin, East Coast and North Florida.) As more packinghouses opened and acreage increased, some packinghouses started to operate farms in several production areas and truck the produce to the packinghouse via the now completed Interstate 75. This increase in acreage and "interstate farming" led to both overproduction and overlapping of production districts as packinghouses continued to either grow or contract for the acreage needed to supply the house with the volume of tomatoes needed for cost effective operation. Since tomatoes and most other vegetables work on supply and demand economics, as the supply exceeded the demand due to the glut of tomatoes available at any one time, the market prices fell and this forced other growers out of business, especially the small, independent grower who had less capital to

keep coming back with. Growers also became "packinghouse" growers, i.e. they were backed by the packinghouse to varying degrees, with the final step being that of a salaried grower for the packinghouse, with commissions based on the success of the crop and season.

In addition, the ever increasing amount of regulations growers are forced to comply with and the amount of recordkeeping and paperwork also had an impact on the situation. It became increasingly difficult for the small, independent grower to comply with the requirements and he often could not afford to hire an individual to handle this as a large packinghouse could.

All this means is that the industry is becoming more "packinghouse driven" to a certain extent. Much of the decision-making is now done by a smaller group. In some cases a packinghouse will have one "farm manager" who oversees the operation of all the farms controlled by that packinghouse. Each farm will have a grower/operator who handles the day-to-day operations. These growers have varying amounts of responsibility depending on the packinghouse. They may make the day-to-day pest control decisions, often along with a scout hired by the packinghouse. They may also handle such routine operations as transplanting, irrigation, harvesting, etc. The scheduling of the transplanting and harvesting is often done with or by the packinghouse in order to meet their schedule and demand for incoming produce. Any large changes, such as irrigation systems, varieties, etc., is usually a decision made by the overall farm manager for the packinghouse, with input from the grower. The few independent growers we have left generally contract with the packinghouse to pack and ship their tomatoes. The growers themselves are in control of their production operations.

What impact does this have on surveys of the type you have conducted as part of the Lake Manatee Demonstration Project? You have already seen one result, i.e., three surveys went out to the same packinghouse, one to the farm manager and the others to two of the growers. The farm manager filled out his survey for all the farms operated by that packinghouse and the growers did not complete their surveys because they knew the farm manager had already handled it. Unfortunately, the implications of this are that you only get one perspective, that of the farm manager, and not of the grower who is on the farm all day, every day. You get his ideas and attitudes which may vary from those of the grower. That may not be a problem if all you are asking for is basic production information. It is very likely a problem if you are trying to ascertain changes in attitudes such as the perceived importance of water quality problems in this area. In one case, you supposedly received a completed survey from both the farm manager and one grower from the same packinghouse. In this case, the farm manager encouraged the grower to complete it as he realized that their ideas and attitudes might differ and thought this was important. It was noted on the survey that the acreage would be a duplication of the farm manager survey. Thus, you are

likely to get different responses depending on the individual or the packinghouse.

I'm not sure how you would handle this in future surveys. I also do not know how widespread this 'problem' is. One thing you need to realize is that if surveys are sent to farm managers, you often get more acreage accounted for than you may realize. This is often the way I get information - I talk with the farm managers. They can provide me with information for several farms and save a lot of legwork. This works primarily for tomatoes. Other vegetables still follow a more traditional production and marketing arrangement.

We have found that when we talk about installation of IMP's which are costly, we deal with the farm manager. When we target the daily management of these systems, we are working with the grower. This probably only increases the confusion and it certainly does not make our work any easier.

I hope this gives you some insight into the production systems we deal with here and how they may affect your survey results. If you have additional questions, please do not hesitate to contact me.

Sincerely,

Phyllis R. Gilreath, Ph.D.
Extension Agent, Vegetables
Manatee Co. Extension Svc.

cc: R. M. Aalberg
M. F. Cole
B. L. McNeal

INSTITUTE OF FOOD AND AGRICULTURAL SCIENCES
UNIVERSITY OF FLORIDA

FLORIDA COOPERATIVE EXTENSION SERVICE

UNIVERSITY OF FLORIDA

Manatee Vegetable Newsletter

Manatee County Extension Service
1303 17th Street / Palmetto, Florida 34221

I. NOTES OF INTEREST

A. Dates to Remember

January 30 - SWFWMD Permit Workshop. Tampa Governing Board Room. Tampa. 8:30 AM.

[illegible]y 9-11 - Fertilizer Institute Meeting, Mariott's Orlando World Center, (202) 675-8250.

February 12-13 - FSGSA-IFAS Seed Seminar, Holiday Inn West, Gainesville, Registration $10.00. Call the Extension Office for more information.

February 13 - Storage Tank Seminar, Tampa. (For info., call FFVA)

March 5-6 - Postharvest Horticulture Institute. University Center Hotel, Gainesville. (Contact Steve Sargent, 904-392-7911.)

March 9-12 - Harvest and Postharvest Handling of Horticultural Crops. Tour of Central and South Florida. (Contact Steve Sargent)

March 15-19 - Second International Symposium on Specialty and Exotic Vegetable Crops. Miami (Contact Don Maynard, 751-7636)

April 28-29 - Florida Agribusiness Computer Short Course. Seminole Community College, Sanford.

B. Available Publications

1. Leafminer Resistance Management in Florida. FFVA, IFAS, Fl. Tomato Exchange.

C. SWFWMD Technical Workshops

SWFWMD, in cooperation with the USDA-Soil Conservation Service (SCS) will be conducting a series of technical training workshops to explain SCS methods for identifying soils and determining seasonal high water level (SHWL) in soils. Persons involved in geotechnical investigation and design of functional surface water management systems are invited to attend. Among those workshops scheduled is one on February 26 from 9 AM to 12 NOON at the Kendrick Auditorium in Palmetto. For other locations, contact SWFWMD.

D. SWFWMD Permit Workshop

SWFWMD's Tampa Permitting Department is conducting a workshop on January 30 to review the current permitting practices. The workshop will begin at 8:30 AM in the Tampa Governing Board Room in Tampa. Topics to be covered include over drainage and

water conservation, coordination of surface water and water use permitting, water table drawdown effects due to ditching and subsurface drains, wetland compensation criteria, update of enforcement department reorganization, "Fast Track Permitting", and an update on surface water permitting for agricultural activities.

While attendance is not limited, please call Eileen Rorabacher at 813-985-7481 if you plan to attend. (Triangle, 42:24)

E. Crop Disaster Program

On January 2, the Secretary of Agriculture Edward Madigan announced the provisions of the Commodity Credit Corporations' 1990-91 crop disaster program. **The application period will run from Feb. 3. through March 13, 1992.** It will be administered by the USDA Agricultural Stabilization and Conservation Service (ASCS) The local office is located in the Agriculture Center, 1303 17th St. W. in Palmetto. This office serves the Manatee/ Sarasota area. Norman Nordlund, the local County Executive Director, has informed us that the disaster provision will affect producers who had crop losses due to damaging weather and related conditions in either 1990 or 1991. The details of the program are still being worked out in Washington at this time, but all indications are that this program could provide relief for many area growers. Producers with qualifying gross revenues of less than $2 million per year may file claims for losses on participating and nonparticipating program crops. As most local crops are considered nonparticipating crops, many growers do not have frequent contact with ASCS. His office is looking forward to working with many new producers. Mr. Nordlund notes that provisions of this disaster program could impact vegetables, citrus, ornamentals, flowering shrubs, trees, turf, honey and many other

commercially grown crops. Producers intending to file should begin to assemble their records now so that they will be ready when the application period opens in February. Producers with crop insurance must have had losses greater than 35%. Producers without crop insurance must have had losses greater than 40%. Payments to qualifying producers are scheduled to begin around April 16. (N. Nordlund, Manatee/Sarasota ASCS)

F. OSHA Recordkeeping Guidelines

The Occupational Safety and Health Act of 1970 and 29 CFR Part 1904 require employers to prepare and maintain records of occupational injuries and illnesses. I have a few copies of the "log and summary of occupational injuries and illnesses" form. Copies can also be obtained, along with a Brief Guide to Recordkeeping Requirements, from Mr. Michael L. Farmer, with the U. S. Department of Labor, Room 624, 700 Twiggs St., Tampa, FL. (813) 228-2821.

G. U.S., Soviets Trade Masterpieces

The U.S. has reportedly struck an unusual deal with Russia. The official Soviet news agency, TASS, announced that the U.S. will be sending tractors and grain to Russia - in exchange for Matisse and Picasso paintings. (Farm Chemicals, Dec. 91)

H. Choosey Tomato Shoppers

Many shoppers would like to have a choice of 'slightly underripe' and 'fully ripe' tomatoes so some can be used immediately and other can be stored for up to a week, a followup study on consumer attitudes toward Florida tomatoes revealed. Other key findings showed that taste and ripeness were the two most common things consumers disliked about regular round tomatoes and use of all tomatoes dropped from 89.6% of all households in five major Eastern markets in 1985 to 84.9% in 1991. (The Grower, Jan. 1992)

II. PESTS/PESTICIDES

A. CEU Recordkeeping

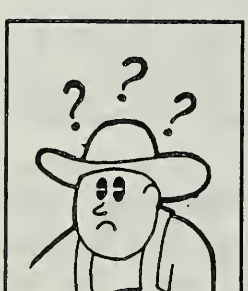
As reported in the last issue of this newsletter, FDACS will discontinue their process of keeping track of CEU's earned by licensees. In order to help you keep track of the number of CEU's you have earned, the Extension Office will keep a file of our copies and/or your copies. Files will be sorted alphabetically according to license category. That way, when you need to know how many points you have, you can give us a call or stop by.

If you attend a CEU-granting meeting sponsored by another organization or county and would like us to keep the form on file, just drop it off with me or Betty in the front office. This is the only way we will have an accurate count.

We hope this will make life a little easier for you.

B. FDACS Restricted Use Pesticide Survey

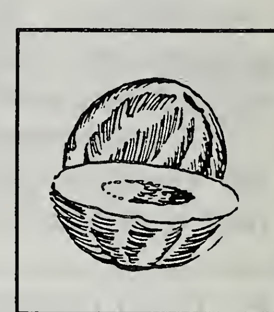
Apparently there have been problems in some areas with the inconsistency in recordkeeping forms compared to information requested by FDACS and with the burden placed on vegetable growers when they receive this survey during the height of the growing season. This year the surveys were mailed late and FDACS is willing to grant a one time extension if you call them. IFAS will be working with FDACS on a recordkeeping form which should make everyone's life easier. If you are one of the "lucky" recipients, do not throw your survey away or totally ignore it, since not completing the survey is grounds for revoking your pesticide license.



(Dade Veg. Newsletter, Dec. 1991)

C. Fungus Attacking Texas Canteloupe

A mystery fungus that struck canteloupe plants in southern Texas over the last five years has been tracked down by USDA and Texas A&M. Spores of the fungus look like black, microscopic cannonballs. The fungus causes a discoloration and rot of canteloupe roots, stunting of vines and premature dying of leaves. Fruit from diseased plants are unmarketable due to smaller size, lower sugar content and scalding by the sun. Although current fungicide sprays are ineffective, research on fumigants is promising. Watermelon, cucumber, squash and pumpkin are susceptible to the pathogen as well. Tracking down the fungus was difficult because it is only one of a number of harmful fungi that colonize decaying cantaloupe roots and its presence is often masked by other fungi. There had been only one other report of the fungus in the U.S. - in Arizona in 1970. (USDA Press Release via Dade Vegetable Newsletter, Dec. 1991)



D. Sprayer Tune-Up Checklist

Before the coming season gets into full swing, spend some time now to check and tune-up your sprayers. Check strainers, valves and pumps for cracks and leaks. Examine nozzles closely to be certain all nozzles on the boom are the same size and type. Check hoses for kinks, wear and splitting. Check supplies for extra tips and parts. Be sure safety gear is on hand and in good condition. Carry rinse water on all spraying equipment. (Spraying Systems Co., Winter 1992)

E. Storage Tank Seminars

FFVA is coordinating a series of meetings to discuss the revised storage tank regulations. DER staff will explain the 1991 changes of both the underground and aboveground storage tank rules. Every registered tank location will be

inspected in 1992. .One seminar will be held in Tampa on February 13. Session I from 9 a.m. till noon will cover underground tanks and 1:30 - 4PM will address aboveground tanks. Registration is $20 for each session or $30 for both, by January 28. For information, contact FFVA. If you need a copy of the registration form, you can pick one up at the Extension office.

F. Section 18 for Trigard on Potatoes

The EPA granted a specific exemption for the use of Trigard to control leafminers on potatoes. This specific exemption expires July 31, 1992. Follow all label directions and precautions.

G. Devrinol Use Changes

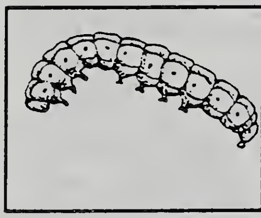
ICI Americas plans to delete the uses of napropamide herbicide on coffee, cucurbits and mint because of the costs and resource requirements of data. The products involved are Devrinol 10G, 50-WP and 50-DF. THe EPA was notified of this action between June and October. (The Grower, Dec. 1991)

H. USDA Food-Consumption Data To Be Used by EPA Flawed GAO Says

A USDA survey EPA uses to measure U.S. food consumption and re-evaluate pesticide tolerances in foods is flawed, because of the survey's low response rate, a Sept. 11 GAO report says. The response rate was 34% for individual food intake in the 1987-88 survey done by USDA with help from its contractor, National Analysts. Low response rates could skew data on subcategory populations such as nursing infants, children 1-6 years old and women of child bearing age, says an EPA toxicologist. So far EPA has not used any of the data and is looking for alternative sources, USDA has not decided whether to throw out the data or warn its users, and GAO recommends cautious use. (Chemical Regulation Reporter, via Dade Vegetable Newsletter)

I. Caterpillars Catch the Flu?

Crop Genetics International Corp. joined forces with DuPont Co. to develop a biotech insecticide that gives caterpillar crop pests "fatal flu". The companies do not anticipate a commercial product for a few years. The National Coalition Against the Misuse of Pesticides is concerned about assessments that such insecticides pose no threat to humans. (Pest Alert, 12/31/91)



J. Vegetable Insect Update

Whitefly - Secretary of Agriculture Madigan determined that the whitefly infestation in California was not a "natural disaster" and did not qualify for federal relief. Unnamed officials say the state was wrongly disqualified on a technicality. Cool weather has slowed the infestation and crop harvests have improved, but an entomologist points out that the number of agricultural crews employed is down considerably. Many fear a surge in the pest as weather warms up. Sec. Madigan said the USDA is committed to high priority for research and monitoring of the whitefly.

According to a LA Times article, the flow of most produce from other regions has made the whitefly's impact on consumers barely noticeable. California growers looking for a solution to the pest are considering leaving fields fallow for August or September to deprive the insects of feeding and breeding opportunities. That would delay melons and vegetables again, making next November more costly for consumers. (Pest Alerts, 12/18,24/91)

A recent California Agriculture magazine article gave a good discussion of the sweetpotato whitefly. Records indicate that B. tabaci has been present in Florida since 1894 and California since the 1920's. Historically, in the

Imperial Valley, whiteflies infested cotton in April and May from a limited variety of overwintering weed hosts. From there, they moved into other crops sequentially. Early terminaton of cotton was eventually mandated as a management strategy. The situation in Florida has been quite different, stemming from greenhouse poinsettia populations in 1986.

Present knowledge suggests there are at least 2 strains of B. tabaci in the U.S. In Florida the strain has been referred to as the 'Florida colony', the 'Florida strain', and more recently the 'poinsettia strain'. The other identified strain which occurs in the Southwestern desert has been labeled the 'Arizona strain', the 'California colony', and 'cotton strain'. In comparative studies with the cotton strain, the poinsettia strain 1)causes squash silverleaf, 2)has an expanded host range, 3)produces more honeydew during feeding, and, 4)lays more eggs. In 1990, heavier densities of immatures, particularly on previously non-preferred hosts (i.e. crucifers) led to suspicions of an introduction of a new strain into southern California. Experiments confirmed this, consistent with similar finds in Arizona in 1989-90. The poinsettia strain in southern California may lead to the occurrence of other vegetable disorders. Silverleaf was observed in Arizona in 1989 and in southern California in April 1991. Recently, the first recorded incidence of tomato irregular ripening was reported in California, on B. tabaci-infested plants growing in a garden in El Centro. California growers can now join their Florida counterparts in the battle of these whitefly-related disorders. (Excerpted from California Ag. 45:6)

On the local scene, Drs. Polston and Schuster from the GCREC conducted a preliminary study this past season on the movement of tomato mottle geminivirus (TMoGV) into and within tomato fields. They found few volunteers in the area of fall tomato fields before fall planting began. Of the volunteers that were found, 15% were infected with TMoGV. Whitefly populations were low with higher rainfall this fall than in the previous 3 seasons. The virus situation which developed was different from the last 3 years. Adult whitefly populations remained low with a low frequency of TMoGV infestations. The exceptions were tomato fields which were near old tomato fields which had been carried over through the summer. When these tomatoes were destroyed, they supplied whiteflies carrying virus to nearby newly planted tomato fields. High rates of predation and parasitism of whitefly immatures were observed in weeds near tomato fields. Growers were also very conscientious about vigorous spray schedules.

Two things can be learned from this. The first is the importance of good sanitation and prompt crop destruction. The second is that timely application of oils, soaps and insecticides can reduce whitefly populations and minimize virus spread when whitefly populations are low to moderate.

Most likely the low populations this past season were a result of good summer sanitation, higher humidity levels which aids fungal parasitism of whitefly immatures, some knockdown of adults by rainfall, and timely spray programs. Studies of TMoGV are continuing this spring with more detailed studies in grower fields which will hopefully answer some of the questions you have regarding virus spread and control. (J. E. Polston, D.J. Schuster)

Broad mites - Caused damage to pepper and eggplant in Palm Beach, Collier, Manatee and Hillsborough Counties last season.

Thrips palmi - have now been confirmed from Palm Beach and Collier Counties this fall. It appears that this new scourge is indeed working its way north. (IPM Newsletter, Dec. 1991)

K. Food Safety Bill Introduced

A food safety bill, HR 3742, was introduced to the House by Rep. Rose (D-NC) that would affect the way the EPA sets legal residue limits for carcinogenic pesticides in food commodities through the Federal Food, Drug & Cosmetic Act.

Rose's bill would also allow EPA to suspend immediately the registration of a pesticide whose use may result in an imminent hazard while officials decide how they want to

proceed with regulatory action. Under current law, suspension of a pesticide registration must be based on findings showing an imminent hazard exists from the use of the product. Then, the registrants of the product have an opportunity for an expedited hearing on the question of whether such a hazard exists. A similar food safety bill may be introduced by Sen Lugar (R-IN). (Chem. Reg. Reporter, via Chemically Speaking, Dec. 1991)

L. DCA Proposes New SARA Fees

The Department of Community Affairs has drafted legislation which would establish new fees for owners or operators of SARA Title III facilities who are required to submit notification or an annual inventory. This legislation, if passed, would amend the Florida Hazardous Materials Emergency Response and Community Right-to-Know Act of 1988. Currently, the annual fee is based on the number of employees. After July 1, 1992, if this proposed legislation passes, the fee would be directly based on factors directly related to chemical toxicity and volatility, quantity and potential hazard to the community of the hazardous materials produced, used, or stored. The factors would be determined from data supplied by owners and operators of facilities. According to the proposal, the fee could not be more than $8000 per facility. Currently the fee is not less than $25 and not more than $2000.

Owners or operators of a facility required to notify or have notified the State Emergency Response Commission (DCA) under Section 302 of Title III would be required to pay an annual filing fee of $200. Currently, this is a one time filing fee of $50. The proposed legislation would allow DCA to be able to assess late fees for failure to submit reports or fees, as much as $8000 or $16000, depending on how late they are.

Again, this is **draft** legislation. It has not been passed. A bill has not been introduced, so we do not know if DCA is making changes as a result of preliminary questions. Several of the commodity organizations are aware of this proposed legislation. (N. Nesheim, IFAS)

III. COMMERCIAL PRODUCTION

A. MSSW Rule Exemptions

'NEW' agricultural projects (those not in existence before October 1, 1984, or which undergo alteration or expansion afterward), may qualify for rule exemption and NOT require managment and storage of surface water (MSSW) permitting. Persons comtemplating agricultural projects should ask the SWFWMD service office about qualifying for a rule exemption. Inquiry should be made during early site planning and prior to clearing or other construction. Field visits and meetings with District staff using the Pre-Application Review process are recommended. The staff of USDA-Soil Conservation Service or an agricultural consultant can also provide preliminary advice on qualifying for rule exemption.

Characteristics of projects which could qualify for exemption are outlined below:

Environmental

1. Wetlands shall not be adversely impacted. Operations shall not be conducted within 50 feet of the exterior boundary of wetlands.

2. Individual farm ponds shall not exceed 0.5 acre in size, nor excavated deeper than 12 feet below ground surface, and shall not divert or impound the flow of surface water using control structures. The excavated material shall be deposited in a manner that does not divert flow away from wetlands. Cumulative size of farm ponds shall not exceed 10 acres of pond surface or 5% of total land area, whichever is less.

Quantity

3. Field ditches shall be used primarily for irrigation or as bedding channels, constructed in a 'V' shape cross-section with a maximum depth up to 24 inches: and the average slope shall not exceed 0.5%. Depth shall be measured below regraded land surface for irrigation ditches and below the bed planting

surface for bedding channels. Field ditches shall be utilized in harmony with other exemption requirements and consistent with USDA-SCS recommended practices. New or expanded main and lateral drainage ditches shall be avoided.

4. Discharge from or within the project shall occur without causing adverse impacts, in a manner similar to that which occurred prior to the project.

5. The flow rate and level of water upstream and downstream of the project shall not be affected in a manner that causes adverse impacts.

6. No filling of flow impeding activities shall occur within the limits of the 100-year floodplain.

7. Drainage pumps shall not be utilized.

8. Operational drainage structures shall not be utilized, but on-site irrigation control structures are allowable.

9. Subsurface drainage systems that lower the soil high water table more than 6 inches shall utilized. 10. The water management system shall be effectively operated and maintained.

11. The project shall be irrigated consistent with the water use permit for the land.

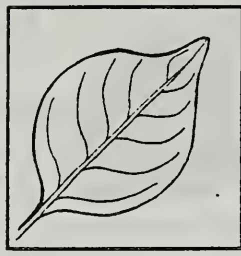
Quality

12. Discharges from the site shall meet applicable state water quality standards, as set forth in State Law. Performance standards are:

12.1. Pesticide applications shall be as limited by the State of Florida Department of Agriculture, and fertilizers shall be applied consistent with IFAS recommendations and based on soil test reports.

12.2. The project shall have an approved USDA-SCS Resource Management System (RMS) Project Plan, which shall be fully implemented during the agricultural operation; or shall have and implement an equivalent Project Plan that is consistent with RMS Project Plan guidelines and Improved Management Practices (IMP's) recommended by USDA-SCS. (SWFWMD Resource Reg. Newsletter, Nov./Dec. 1991)

B. Plant Sap Testing Protocols



Plant sap testing for nitrogen and potassium is being more widely adoptd in Florida vegetables, especially for timing N and K injections in drip irrigation. The following guidelines will hopefully provide a common baseline for growers in interpreting results.

Sampling

Time of day: Temperature and time of day influence sap nitrate content. Research indicates 10 AM - 2 PM gives the most dependable results.

Leaf age: Use most recently matured leaves, those that have stopped expanding in size.

Leaf part: The tests were calibrated using the fleshy petiole of the leaf. For tomatoes, strip the leaflets off leaving a petiole about 8 inches long in normal situations. For some crops such as pepper or eggplant, the lower part of the leaf blade can be trimmed away to gain more petiole per leaf. Trim only about the lower one inch of the blade away. Throw out the rest of the blade and midrib.

Number of leaves: Use enough leaves to insure a representative sample f the field being tested. Usually 20 leaves will represent a 5 - 10 acre field. Crops will small 'dry' petioles will require more for an adequate sample.

Sap Pressing

Equipment: A garlic or lemon press will work to squeeze the sap from the petiole pieces. You may also invest in a hydraulic plant sap press from the HACH Co. Other equipment includes sampling knife, scissors, paper towels, distilled water rinse, chopping board and knife and testing kit.

Storing petioles: It appears that fresh petioles can be stored on ice for up to 8 hours without appreciable change in sap nitrate concentration. Store whole unchopped petioles, not whole leaves. Petioles can also be stored at room temperature in a plastic bag for up to 1 1/2 to 2 hours. Always store petioles only. Do not

store sap. Cold petioles should be warmed to room temperature before reading since temperature differences between sap and meter might affect results.

Reading time frame: Measurement of the nitrate content of the pressed sap should be made within a minute or 2 of pressing or readings will change from the fresh petiole condition.

Test Kit Management

Calibration: With the colorimetric kits, calibration with a known solution will help tell if your chemicals are still good. Chemicals on the test strips or in powder pillows deteriorate with time and with exposure to heat and light. The electrode testing kit will need to be frequently calibrated with standard solutions, every 5 or 6 samples. Avoid direct sunlight on the meter.

Calibration scale: Samples should read within the calibration scale of the test kit. If the sample is off scale, the sap will need to be diluted.

...e: Store kits and chemicals in a protected place and within temp. ranges specified by the manufacturer - not in the pick-up truck or pump house.

Calculations

Nitrate conversions: Some kits read out in nitrates and some in nitrate-nitrogen. The calibration tables developed by IFAS are in nitrate-nitrogen values. For kits that read out in nitrates, divide by 4.43 to get nitrate-nitrogen. Potassium is usually read directly as ppm K+.

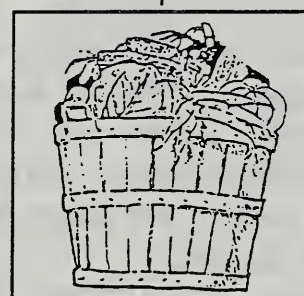
Sap versus dried petioles: There are some published book values for petiole nitrate-nitrogen. These book values are usually based on dried petioles and are not directly transformable to fresh sap nitrate-nitrogen concentrations. (Hochmuth, Vegetarian, 91-12)

C. Detergent Trials on Tomato

Many of you saw the information presented at the Tomato Institute on the effect of high concentrations of detergent on yield of tomatoes. Additional studies have been conducted and preliminary results indicate that as long as concentrations of detergent (New Day was used in these trials) are no greater than 0.25%, no yield loss should occur. This rate is one that has been commonly used in SPWF control programs. (Vavrina, Jan. 9 memo.)

D. Outlook 92: Vegetables

The outlook for the coming vegetable crop season is encouraging for Florida vegetable growers. Planted acreage is lower or about the same for most vegetable crops. Mexico has reportedly decreased their vegetable acreage by 15 to 20%. Numbers like these typically indicate that returns should improve over the previous year for many growers.



Many uncertainties still remain for vegetable growers. While reported acreage is lower for many crops, prices going into the fall season are also low for some crops. The tomato crop was averaging just over $7.00 in early November. These are comparable to last season but prices softened last year as Mexico entered the market.

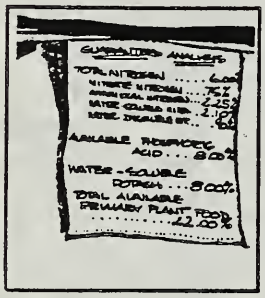
A North American Free Trade Agreement is being negotiated between Mexico, Canada and the U. S. Florida growers have reason to be concerned over a NAFTA. Mexico has many advantages over Florida in many of the resources used in vegetable production. Another reason for concern is that Mexico may lose in the battle for producing grains in North America, meaning that many of those grain producers will be looking to alternatives, of which vegetables will be one. If that scenario were true, then producers in Florida and Mexico may both be hurt. A NAFTA may impact growers returns for many years to come. (J. VanSickle, FRED Newsletter No. 103)

E. Fertilizer 'Dropout'

An informative spinoff from the Lake Manatee Demonstration Project has included the rediscovery and further study of fertilizer

of high specific gravity. The concentrated salt solution then drops as a unit through the underlying water column. This leads to rapid fertilizer loss from the root zone and increases the potential for groundwater contamination.

The 'dropout' process can be triggered in the plastic-mulched, seep irrigated sands of the Lake Manatee area when the water table moves up to within 6 to 8 inches of the soil surface. The fertilizer in the band on the bed surface will then dissolve rapidly and proceed to drop through the underlying water. Although growers in this area strive for a 16-20 inch water table, often 10 to 12 inch water tables are not uncommon, especially during rainy periods or periods of overwatering such as early in the season. Under such conditions, levels can rise fast during heavy rainfall events, setting the stage for fertilizer dropout.



Growers are being encouraged to maintain a set of in-field water table observation wells to improve their water table monitoring capabilities. These simple, inexpensive wells can even be checked on a drive-by basis.

Two other situations which increase vulnerability to dropout are fertilization of freshly-formed, very wet beds, and high fertilization rates. It is not uncommon during the summer rainy season that beds are formed under wet conditions. Fertilizer bands placed on the bed surface will immediately begin to dissolve and be subject to dropout. Also, dropout increases markedly at higher fertilization rates. Keep fertilization rates within reasonable limits, near IFAS recommendations. This, combined with careful water management should reduce fertilizer 'dropout'. (B. McNeal, Highlights in Soil Science, Fall 1991)

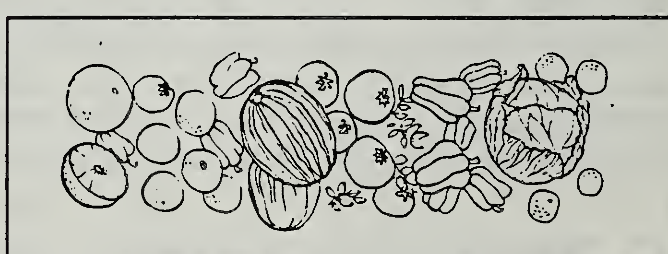
F. Fall 1991 Variety Trials

Variety trials were conducted this fall by Terry Howe at the GCREC on tomatoes, peppers and slicing cucumbers. The following is a brief summary of some of the results. For a more detailed listing of yields and size information, please contact me or Terry. The complete research report will be out in the near future.

Tomatoes: Tomatoes were transplanted on August 20 and harvested November 4 - 25. Several named varieties had excellent yields - including Heatwave (Petoseed), Merced (Rogers/NK) and Solar Set (IFAS). Both Heatwave and Merced gave large fruit with good early yields. Solar Set also provided high yields. Heatwave had a lower incidence of heat scar than in some previous trials. Merced, although showing some radial cracking, had excellent yields to compensate. Several numbered cultivars from IFAS gave high total yields, including 7430, 7249B and 7264 and may be worth watching in the future.

The bell pepper trial was transplanted August 26 and harvested Nov. 5, 11, 26 and Dec. 9. High yielding varieties included King Arthur (Petoseed), Ssupersweet 860 (a yellow pepper from Abbott & Cobb), and PR300-7 (Pepper Research). A heavy worm population created some problems with yield; however, marketable yield was adjusted for this.

The slicing cucumber trial was field sown on August 28 and harvested from Oct. 4-30, 1991. The most obvious thing about the results from this trial was the lack of significant differences between most entries. Based on Terry's observations, looking at early fancy yield, noteworthy entries included Maximore 103 (Abbott & Cobb), FMX 4761 (Ferry-Morse), and HSR 181 (Hollar). This trend also carried over to the U.S.#1 for early yield. Raider (Harris Moran) also looked good. (T.K. Howe, GCREC)



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The use of trade names does not constitute endorsement to the exclusion of other products.

MANATEE VEGETABLE NEWSLETTER JANUARY/FEBRUARY 1992

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Phyllis R. Gilreath
Extension Agent, Vegetables

Manatee County Coop Ext Service
University of Florida
1303 17th St. West
Palmetto, FL 34221

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Florida
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Madison, WI 53706

Questions for Post-interview. Use for both telephone and personal interviewing.

Respondent Name ______________________ Date of Interview ______

Respondent ID Number ____________________

1. About how long did it take you to fill out the survey?

2. Did you have to ask anyone else for information to answer a question? If yes, whom did ask and what was the question about?

3. Do you recall any problems with any of the directions for answering questions? If so, which?

4. Do you recall any question that you weren't relevant to your operation? Which?

5. Do you recall that were especially hard for you to answer? Which? Why?

6. Do you recall any questions that were too personal for you to answer? Which?

7. Do you think most other farmers in this area will be willing to assist us by filling out this survey? If no, why not? How could we improve it?

W1S_NC2.XLS

	A	B	C	D	E	F	G	H	I	J
1	ID	Sample	Farm #	Related Farms	Fst Name	Lst Name	Street	C/O	City	State
2										
3	611101	D	Sample						Mount Olive	NC
4	611102	D	1385	4383, 858					Mount Olive	NC
5	611103	D	Sample						Albertson	NC
6	611104	D	Sample						Mount Olive	NC
7	611105	D	Sample						Mount Olive	NC

K	L	M	N	O	P	Q	R	S	T	U	V	W	X
Zip	Salutation	*	Adv Ltr	Adv Ltr ou	Srvy1 out	Srvy back	Disqual	RM1 out	Srvy2 out	RM2 out	NR FU	NR sent	NR done
			(Date)	(Date)	(Date)	(Date)	(Code)	(Date)	(Date)	(Date)	(Y/N)	(Date)	(Date)
28398	Mr.	*											
28365	Mr.	*											
28508	Mr.	*											
28365	Mr.	*											
28365	Mr.	*											

Y	Z	AA	AB	AC	AD
NR result	Sent RS	Batch #	Date enter	DE person	Filed
(Code)	(Date)	(number)	(Date)	(initials)	(Date)

APPENDIX C.3

**Water Quality
Demonstration Project
East River**
1221 Bellevue Street, Suite 103
Green Bay, WI 54302
(414) 468-4502

January 8, 1992

5~ 6~
7~
9~, 10~ 11~

Dear 12~ 6~,

You're one of a small number of farmers randomly selected to represent all producers in the East River Watershed area. We need input and advice from you to help us develop effective water quality programs for this area.

The Water Quality Demonstration Project--East River is a joint undertaking by the Cooperative Extension Service, Soil Conservation Service, and Agricultural Stabilization and Conservation Service. Its purpose is to work with you and other farmers to help protect water quality through voluntary cooperation at the local level.

The success of the project depends in large part on getting the views of farmers like yourself on farm management, water quality and other related issues. Within a week or so you'll be receiving a survey asking about such matters. This survey is being done by a USDA-sponsored outside agency -- the College of Agriculture at the University of Wisconsin -- to help insure objectivity, as well as your confidentiality. We will not see your individual answers, only a statistical summary of the results.

Your answers will be extremely important since only a limited number of farmers -- chosen at random -- will be surveyed. The answers you give will be used to help make future East River Watershed area programs more responsive to the needs of farmers like yourself.

We realize how valuable your time is, and wouldn't be asking you to cooperate if your own personal responses weren't critical to us. Please keep an eye out for a large envelope containing the survey, and then complete it and return it at your earliest convenience. We want to thank you in advance for your cooperation with this important project. Please call us at (414) 391-4622 (J. Hunt) or (414) 391-4610 (J. Plog) if you have any questions or concerns.

Sincerely,

Jim Hunt	Jim Plog
District Conservationist	Agriculture Agent
Soil Conservation Service	UW-Extension, Brown County